THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CXI. No. 2461.] LONDON, JULY 12, 1910. [62ND YEAR. PRICE 6d.

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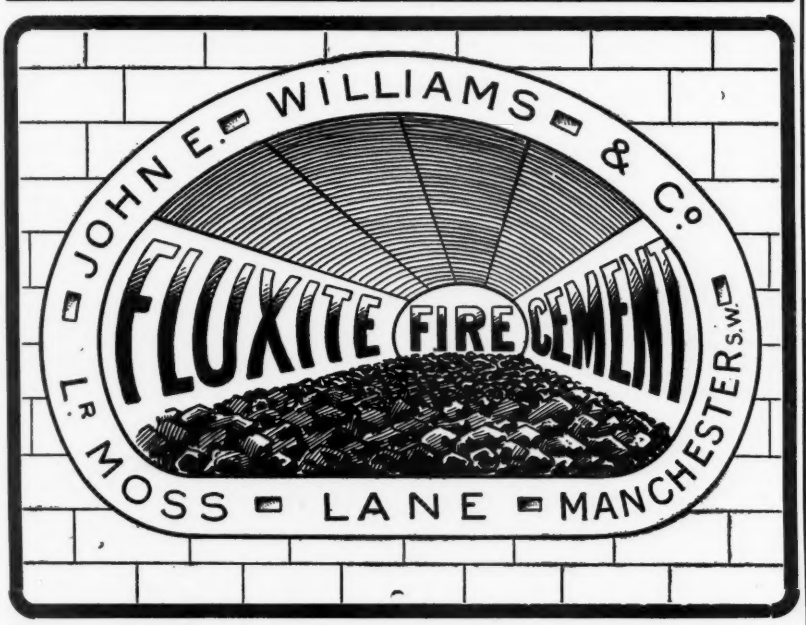

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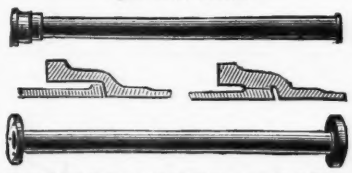

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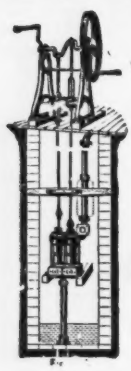

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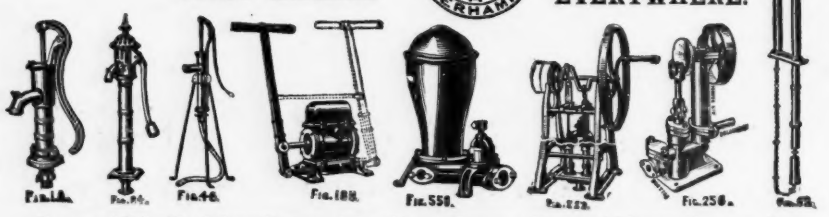

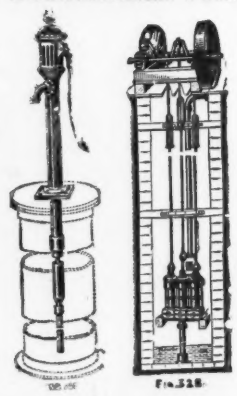

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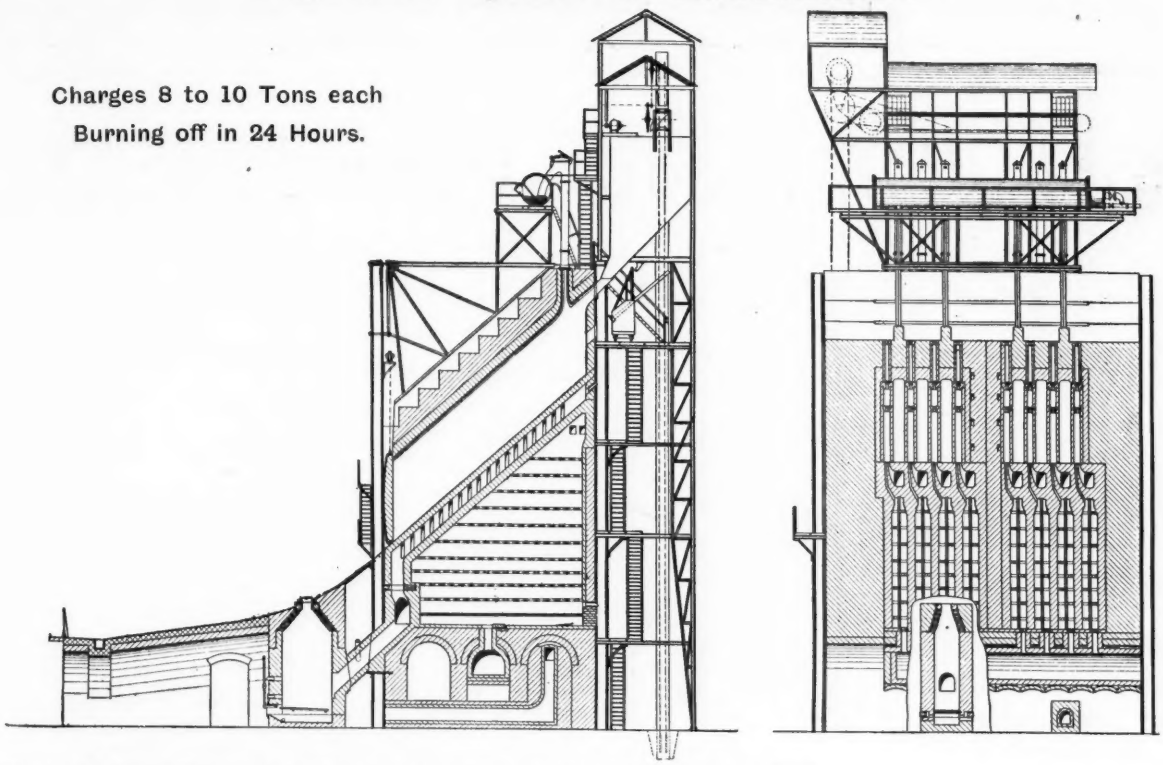

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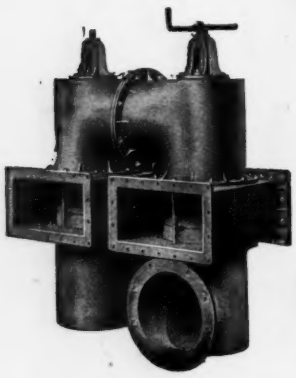

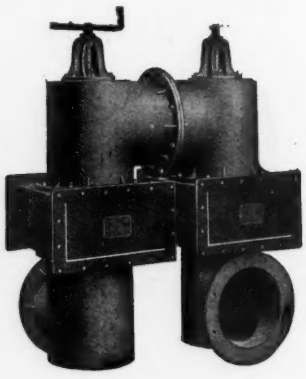

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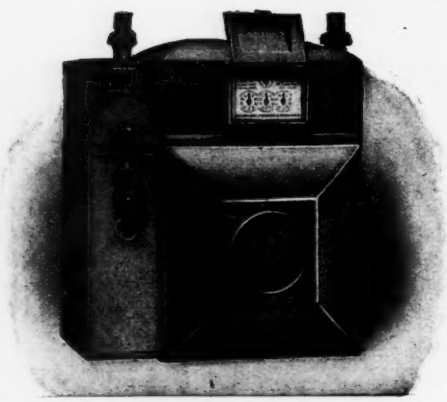

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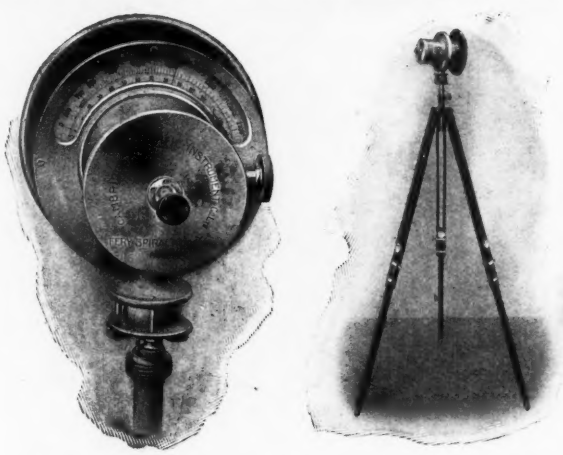

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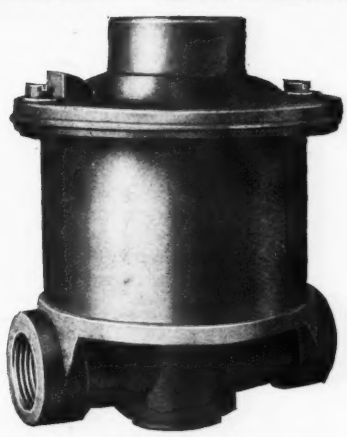

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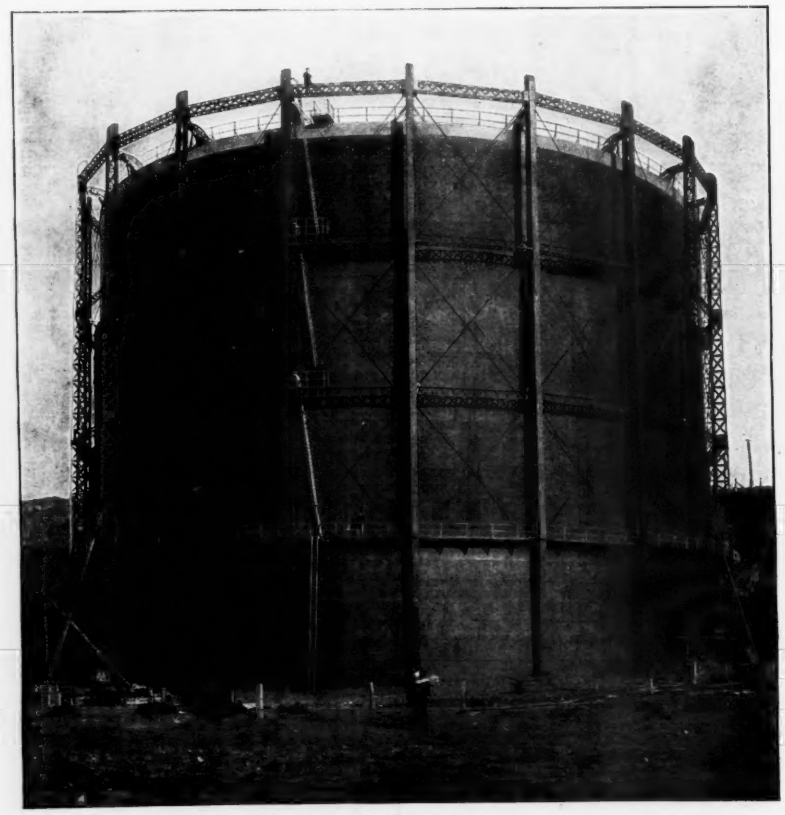

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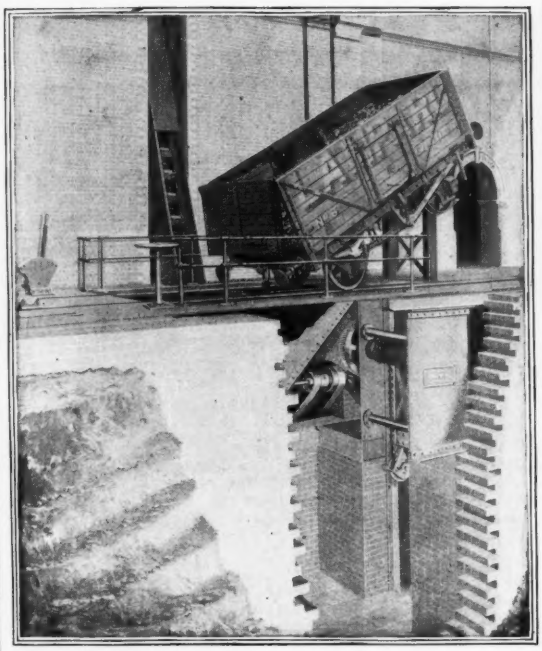

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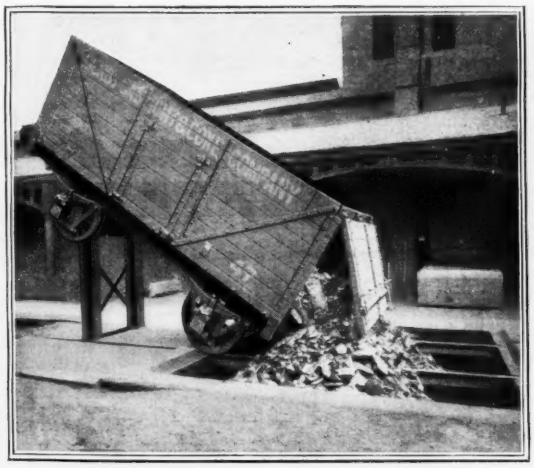

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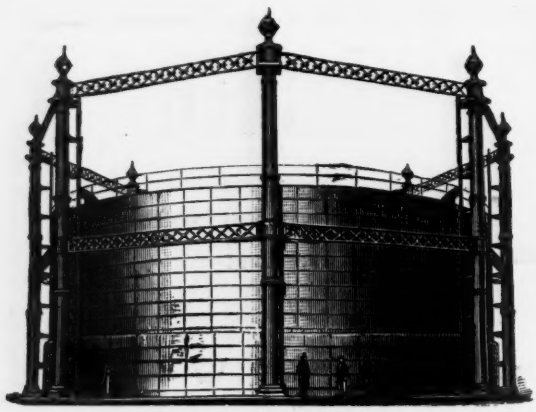

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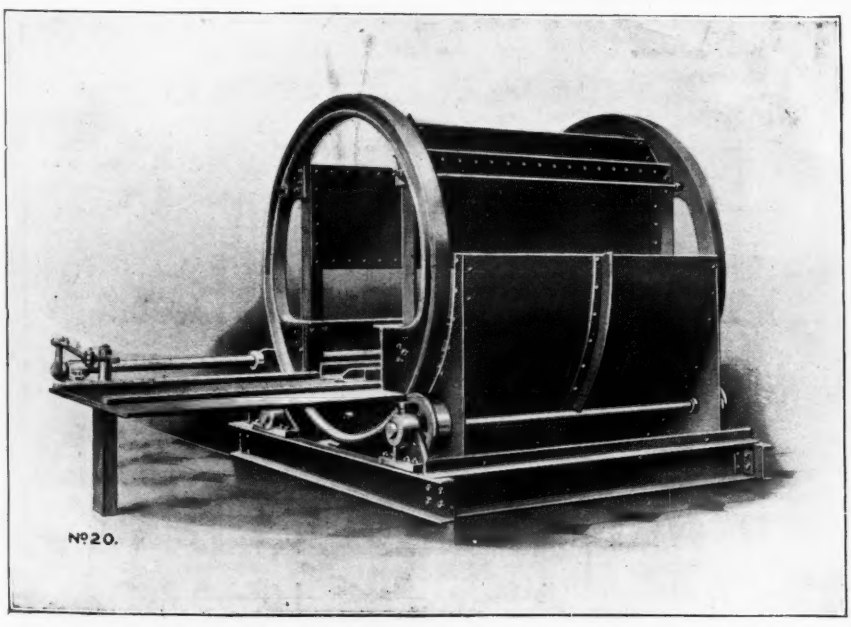

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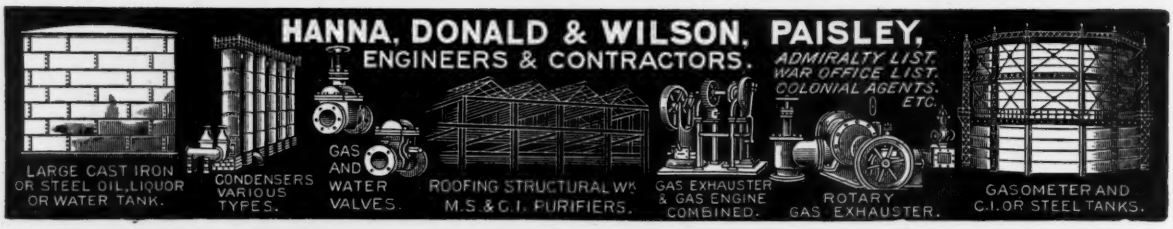
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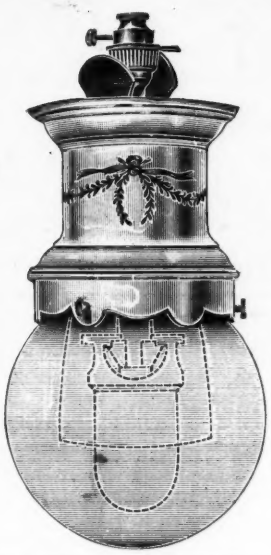

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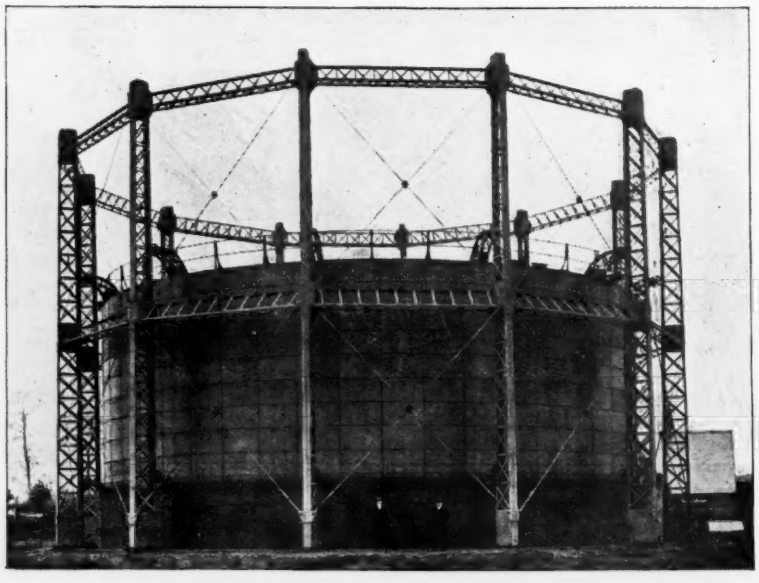

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CONTENTS.

EDITORIAL NOTES.

GAS, &c.—
The Fight for the Standard Burner . . . 91
Lessons from Königsberg 92
Sulphate of Ammonia Production in Gas-Works 92
Through Coalite Glasses—Past and Future—Gas in Industry—A Gross Falsehood—The Humorous Side of Jealousy—Separate Management—The Organization of Labour—In London Suburbs 93

Gas Stock and Share Market 95
Electricity Supply Memoranda 95
Notes from Westminster 96
Lost Dividend Warrants. By H. D. Ellis . 97
The Quality of London Gas 98
Flooding of the Gas-Works and Interruption of the Gas Supply at Zürich 98
Gas Association Affairs in America . . . 99
The New Hoboken Gas-Works at Antwerp . 100
List of Successful Candidates—"Gas Engineering" and "Gas Supply" Examinations 106
Examination in "Gas Supply," Third Year—Answers to the Questions Set 108
Extraction of Naphthalene by Water Gas Tar. By G. M. Gill 109
The Königsberg Gas-Works 111
Brussels Municipal Gas-Works 112
The Forrest (Brussels) Gas-Works 113
A Prosperous Cornish Gas Company . . . 115
Illumination of Interiors—Artificial Illumination by Gas and Electricity 116
Société Technique Papers—
M. Bromham on A Turbine for the Continuous Treatment of Sulphate . . . 115
M. Grebel on Light-Economizing Reflectors for Street-Lamps 117
M. Chevalet on Treating Ammoniacal Liquor in Small Gas-Works 117
M. Largeron on a New Form of Pressure-Gauge 118
M. Camille Roche on the Use of Aluminium in Gas-Works 119
Troubles with Producer Gas-Engines . . . 119
Natural Gas and Petroleum in America . . 119

REGISTER OF PATENTS.

Apparatus for Heating Air—Cloake, A. G. . 120
Mouthpieces or Ascension-Pipes of Gas-Retorts—Farquhar, W. B. 120
Gas-Heated Radiators—Yates, H. J. . . . 120
Stop Mechanism for Prepayment Gas-Meters—Milne, J., and Alexander, W. 121
Torch Traps for Street-Lamps—Parkinson and W. & B. Cowan and Cheshire, W. . . 121
Separating Tar from Combustible Gases—Burstall, F. W. 121
Applications for Letters Patent. 122

CORRESPONDENCE.

Gasholder Tanks with Bulging Sides . . . 122
The Königsberg Chamber Settings . . . 122
A Result of Electrolysis 122
The Coalite Company and their Patents . . 123

PARLIAMENTARY INTELLIGENCE.

Progress of Bills 123
Brownhills and District Gas Order . . . 123
Gas Companies (Standard Burner) Bill (No. 1) 124
Glasgow Gas Consolidation Bill 133
Swansea Gas Order 134

LEGAL INTELLIGENCE.

Promotion of the Amman Valley Gas Bill—Action by Solicitors to Recover Costs . . 134
Gas Poisoning through Alleged Defective Fittings 134
Mr. Ewing's Action against the Greenock Corporation 134

MISCELLANEOUS NEWS.

Belfast Gas-Works Extensions—The Twin Island Site Again 135
Bradford Corporation Gas Department . . 135
Oldham Corporation Gas Department—Annual Report of the General Manager . . 135
Salford Corporation Gas Department . . . 136
Stockport Corporation Gas Department—The Engineer's Annual Report 136

MISCELLANEOUS NEWS (*continued*)—

Progress of the Lincoln Gas-Works . . . 137
Hereford Corporation Gas Undertaking . . 137
Stoke-upon-Trent Gas Department . . . 138
Rhyl District Council Gas Supply 138
Mansfield Gas-Works Extensions 138
Public Lighting of Oswestry 138
Rhymney Valley Water Supply 139
Port of London Rates — Gas Companies' Opposition Withdrawn 139
Gas Stock and Share List 139
Gas and Electricity Supply in Massachusetts 140
Electric Lighting at Hastings 140
Municipal Engineers and Water Supplies . 141
Notes from Scotland 142
Current Sales of Gas Products 143
Coal Trade Reports 144

PARAGRAPHS.

The Professorship of Coal Gas and Fuel Industries at Leeds 99
The Late Mr. Greville Williams 105
The Life of a Gas-Meter—Society of Chemical Industry—Water Gases 110
Gas Companies' Accounts for 1909 116
New Water-Works for Bacup 122
Gas *v.* Electricity for Museum Lighting—Kenilworth Gas Company 134
Suicide by Gas at Royston 139
East Surrey Water Company—Reduction in Price at Knaresborough 140
St. Helens and the Standard Burner Bills . 143
Water Scheme for Warrington—Liquidation of the Automatic Gas-Lighter, Limited—Cost of Public Lighting at Hackney—The New Public Lighting Contract for Westminster . 144
Gas and Electricity at Manchester—Not Water-Gas Victims—New Joint-Stock Companies—Water Troubles at Uttoxeter—Prepayment Meter Charges for Gas at Bolton—Finsbury Public Lighting 145
Increased Meter-Rents at Salford—Carlisle Gas Profits—Failure of the Electric Light at Brighton—Fatal Gas Explosion at Meaux—Meldreth and Melbourn District Gas and Water Company, Limited 146

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EDITORIAL NOTES—GAS, &c.

The Fight for the Standard Burner.

IT has seemed an interminable lane through which the gas industry has been passing in securing as the recognized standard test-burner the "Metropolitan" No. 2; and it is most sincerely hoped that the end of the lane has at length about been reached. The whole of the time devoted to the sittings of Sir Henry Kimber's Committee last parliamentary week was taken up in pacing ground beaten and worn by repeated passage, and every inch of which is now so well known. But the opposition weakens. Of that there is not the slightest doubt. For every contest before Committees leaves the case that hostility has so laboriously constructed more and more dilapidated, not only by the opponents' own resistance to obvious facts, but by throwing themselves blindly against the strength of years of parliamentary enactment and legislative intention, and by the mass of inconsistency of which their own case is composed. Those who represent the opposition are conscious of all this. It is as manifest as anything can well be to close observers of the proceedings in the Committee rooms. Still they persist in the quest for something definite to which no parliamentary enactment has given them the right, but which is gained, excepting in the case of some local authorities, by means which Parliament, in its wisdom and by its foresight, has provided. What the representatives of hostile local authorities do not, or will not, recognize, some of the hostile authorities themselves do recognize. They see the strength of the case for the burner; and they see the fatuity of continuing to oppose the inevitable, with the result that, when Nos. 1, 2, and 3 Standard Burner Bills came, on Monday last week, before Sir Henry Kimber's Committee, the opponents were comparatively few, although the whole case had to be fought precisely as though their number was great. As instructed by the House, the Liverpool case was set apart for distinct consideration, in view of surrounding special circumstances.

We will not devote time to any comment on the case for the new standard burner. It is known by all professional gas men in the country; and it is accepted by all but a modest percentage—so modest as to be negligible, were it not that this infinitesimal number claim the only exact knowledge on the question, and claim to have discovered, by their exploration, where the new burner leaves loopholes and invitations to the gas companies of the country (of course, not to the local authorities) to depart from the path of administrative morality. All that we will say in passing is that the case for the Bills was presented by Counsel (may we without exposing ourselves to any invidiousness specially mention as having done yeoman service, Mr. Honoratus Lloyd, K.C.?) and expert witnesses with a cogency and with a full sense of responsibility to the gas industry, present and future, that stand in striking contrast to the flimsy and disjointed case of the antagonists—a case that had all the weaknesses of the one submitted in the House of Lords accentuated, and a case in which the witnesses completely failed to support one another.

The Committee, it was early apparent, through the interjections and specific inquiries of Sir Henry Kimber and his colleagues, had set themselves the task of discovering from Counsel and witnesses two things: (1) What has been the intention of Parliament, as revealed by past enactment, in this matter of testing; and (2) which burner of those at present recognized statutorily is the most accurate for testing all qualities of gas? From these two points, the opposition struggled, mainly by keen and deliberate evasion, to escape. But they were unsuccessful, through the firmness of Sir Henry Kimber. There was nothing for it, but in the end to admit that Parliament has never established any legislative finality in the test-burner, but has always conceded the right of gas suppliers—a right the opposition have tried their best to filch from them—to have the burner that would develop the maximum illuminating power of their gas. The standard candle power has been fixed, the standard or maximum price (usually the actual price is much lower) to be charged for that candle power has been fixed, but the standard test-burner has been given subject to the right of unconditional revision, either through Act of Parliament or, in many cases, on appeal to the Board of Trade. In the changes of test-burner that have been made, the original principle of maximum illuminating power development has prevailed; but never has there been the fuss, the allegations, the insinuations that have marked the latter-day essential, with lower illuminating power standards, of a burner that will accurately and relatively deal with all standards, without producing the exaggerations of a burner designed for one quality of gas, and that a straight coal gas. We heard again, *ad nauseam*, of the differences between the readings of testings with the No. 1 and No. 2 burners on grades of gas for which the No. 1 burner was never intended to be used, and which wide differences prove, if anything at all, the inefficiency of the No. 1 burner, and not the inaccuracy of the No. 2.

The Committee no doubt heard with amazement from Mr. Isaac Carr that, though the intentions of Parliament in the past may have been good enough, the House of Lords, the House of Commons, and the Board of Trade (though technically advised) had never understood this question, and that the whole of the legislation in gas matters has been directed and dominated by the gas companies, and some local authorities —Manchester for example—have ill-advisedly followed. Similar thoughts possessed his mind over the sulphur compounds abrogation clauses. His opinion is a reflection on successive Parliaments and numerous Committees of the House of Lords and House of Commons. There is danger in telling a Parliamentary Committee of the incapacity of their kind for judicially dealing with a question of this sort. Indirectly Sir Henry Kimber pointed out the reflection by remarking to Mr. Carr, "I hope you will give the present Committee "credit for endeavouring to understand." Mr. Ram, K.C., rescued Mr. Carr from an unhappy predicament with the reply: "We feel that, Sir, strongly." But the assertion of Mr. Carr that Parliament and the Board of Trade have the last few years been ignorantly doing this thing, is an admission that the whole of the educational work of himself, Mr. J. G. Newbigging, and Dr. Frankland has been an utter failure. Wherein has been its defect in enlightening those whom it sought to instruct? We leave the answer to the gentlemen named, and to the profession generally.

Then as to the question of the most accurate burner for all qualities of gas, one after another the witnesses came forward and testified that of statutorily prescribed burners the No. 2 is the best—this not only from the witnesses for the Bills, but from the witnesses for the opposition, with one exception, and that Mr. Carr, who has shifted his ground in this respect since Mr. Charles Carpenter's evidence in the House of Lords. Now Mr. Carr is of opinion that the burner is capable of the most improper use at the will of the gas maker. "In other words, you think a gas "company might fraudulently defeat the test?" he was asked. His reply was "I do. I say that this opens up a possibility "I never dreamed of until this matter came forward." To do Mr. Carr full justice, readers may be asked to refer to the report of the cross-examination on the point in our "Parliamentary Intelligence." However, while Mr. Carr's conscience will not allow him to use the burner at Widnes out of a pure affectionate regard for the consumers, Mr. J. G. Newbigging's conscience will allow him to do so at Manchester, and the consumers do not appear to be a penny the worse.

The latter gentleman sees no objection to the burner if a *quid pro quo* is given to the consumers. Candle power has been dropping at Manchester by something like 4 candles during recent years, the price of gas remains the same,

profits have been taken in aid of the rates to the tune of from £50,000 to £70,000 a year, and profits have also been largely spent on the works. Since the undertaking has been under municipal control, an amount of profit greater than the whole loan capital of the concern has been transferred in aid of the rates! But, says Mr. Newbigging, companies must not be allowed any such free hand in dealing with the fruits of economy that may arise in consequence of the change of burner; and he doubts—in the case of gas companies—the sufficiency of the machinery already provided by Parliament to produce an equitable distribution of the fruits of economy, to which machinery local authorities have no equivalent. It strikes us as rather—well, interesting to have some one from Manchester to teach the portion of the industry represented by private enterprise the ethics of this question. We are not surprised at Sir Henry Kimber looking up wonderingly, and asking, "Are the gas companies "not to be trusted at all to act honestly?" For whom, however, is the compensation required that has not been given in Manchester? For that stupid obstructionist, the flat-flame consumer, who continues to penalize himself by rejecting the economy and efficiency of incandescent burners. We may look round London, Glasgow, and numerous other places, and find no complaint from the consumers, and no confirmation of swelling gas accounts; and, notwithstanding the degradation of candle power ascribed by Messrs. Carr and Newbigging and Dr. Frankland, the incandescent street lamps are found giving excellent illumination. By the way, once more we heard from Dr. Frankland that the higher the illuminating power of gas, the better; and from Mr. Carr, the contradiction. All through there was the old want of cohesion and consistency in the case of the opposition. But enough of it. Do let the opposition witnesses look at the matter from the standpoint of solid practical experience, and not let fancies take possession of them to such a degree that they become a petrified part of their professional creed.

The case has been concluded for Nos. 1, 2, and 3 Bills; and the Committee are now considering the separate case of Liverpool. They did not sit yesterday; but will be doing so to-day. The case should not take a great while, as so much has been disposed of in considering the original Bills. After that, the decision; and we look for justice being done to the promoters. That is all they ask for; it is all they expect. And in the Committee they have complete reliance. If the decision is as we fully hope it will be—an unconditional one as in the Lords—uniform gas testing will have received a big forward move.

Lessons from Königsberg.

THE full description of the Königsberg Gas-Works which has appeared in the last two numbers of the "JOURNAL," and which is supplemented to-day by an account of the development of the Königsberg gas undertaking and of the methods of charging for gas supplied which have been adopted from time to time by it, contains some suggestive information for the consideration of English gas managers. On the Königsberg works, most types of gas-making plant have been tested on a fairly large working scale; and the more important results of the comparison of the different types of plant are collected in the table which appears on another page of to-day's "JOURNAL." This table is worth a few minutes' careful study, though the particulars as to the cost of water gas relatively to coal gas are naturally not complete as given. At Königsberg, water-gas plant has been erected more than once with the object of staving off the time when an extension of existing carbonizing plant would have to be carried out; and in this respect it has proved a valuable auxiliary to the latter. It undoubtedly possesses the advantage that in the summer months it can be completely shut down, as it was on the occasion of our representative's visit to the Königsberg works a fortnight ago, and the capital and ground space so rendered idle for the time being are less than with coal-gas plant of corresponding productive capacity. At Königsberg no serious difficulty has apparently been experienced by consumers from the supply at one time of neat coal gas, and at another of coal gas mixed with a large proportion of either simple or carburetted water gas.

The rates of charge for gas in Königsberg seem to have been the subject of continual alteration since the earliest days of the gas undertaking, when it was open to consumers to take a supply either by meter or at a fixed charge per burner for a specified number of hours' use per diem. Differential prices were introduced in 1886, and a supply for heating or power purposes could thereafter be had through a separate meter for 3s. 5d. per 1000 cubic feet, as compared with 4s. 6d. for the ordinary lighting service. But as years went by, this arrangement proved unsatisfactory; and it was found necessary to allow at first one and then two lighting burners on each heating gas supply. This arrangement, however, reduced the consumption of gas at the higher rate charged for lighting purposes; and it was found that a large number of the lighting supply meters were merely retained to give a reserve supply of light in case of failure of the electric light. The rents of the larger meters were accordingly increased, with the result that more and more of the consumers were driven to take only the heating gas supply. Permission was then granted to such consumers to use more than two lighting burners on that supply, provided a small supplementary payment was made in respect of each additional lighting burner. The general result of these arrangements has been that (as is shown in a diagram on another page of to-day's "JOURNAL") the consumption of gas in Königsberg has increased latterly at about the same, or a rather greater, rate than the consumption in Berlin, where a uniform price of 3s. 6d. per 1000 feet has been charged since 1901 for gas supplied for all purposes.

Reviewing the whole course of procedure in Königsberg since differential prices were introduced in 1886, it seems hard to believe that any adequate compensation has been secured by the gas undertaking or the consumers for the complications involved in the system of dual supplies of gas for different purposes, with the subsequent modifications introduced so as to avoid such re-duplication of services and meters in a majority of the tenements supplied. So far as we can judge from the account of the changes which have been rung from time to time, however, it would appear that at first gas was supplied for heating purposes at an unremunerative rate, and that it would have been impossible at the time to have sold the whole output of gas at that rate. It was then sought to maintain the lower rate for the bulk of the consumption, while reducing the duplication of services as far as possible. It is open to question, however, whether better results and greater economy of administration would not have ensued if the whole of the gas had always been supplied at a uniform price slightly above that charged for gas supplied through a special meter for heating purposes, and considerably below that charged for gas for lighting purposes. No substantial advantage appears to have been secured by the varied Königsberg methods which would not have been obtained, in at least corresponding measure, by the simple English practice of a uniform price, which, since its adoption in Berlin, has proved equally successful there.

Sulphate of Ammonia Production in Gas-Works.

THE report of the Chief Inspector under the Alkali Works Regulation Act for 1909, which was noticed in the "JOURNAL" last week, is the last that Mr. R. Forbes Carpenter will sign as the Chief of the Department. While very hearty welcome and good wishes are accorded his successor, Mr. Carpenter's retirement is a matter of regret to not only those who have been brought into contact with him in his official capacity, but to all technically engaged in the gas industry. In the exercise of his duties, his office has been kept so largely in the background, that he has been looked upon as a "guide, philosopher, and friend," and not as one whose duties it has been to see that the law is complied with in the particular directions that come within the scope of the Act.

There may be an early opportunity of looking a little deeper into the report in connection with the studies as to the interaction of methane and ammonia in the presence of carbon. Meantime, however, there is rather an interesting point regarding the production of sulphate of ammonia in this country. The figures that we published earlier in the year from the reports of Messrs. Bradbury and Hirsch are largely estimates; the figures that are published in the annual report of the Chief Inspector are obtained direct from the manufacturers. In regard to the total as to production, it is remarkable how close Messrs. Bradbury and Hirsch get their figures; but in the constituent items of the total for 1909, according to those now before us, they over-estimated, by between 6000 and 7000 tons, the production of gas-works (171,000 tons), and were nearly the same amount short in their estimate of the production of coke-ovens, producer-gas plants, &c. (101,000 tons). The more definite figures of the Chief Inspector show a total recovery

and production of sulphate of ammonia during the year of 349,143 tons, as compared with 325,228 tons in 1908, or an increase of 23,915 tons, as compared with an increase of 11,947 tons in 1908 upon 1907. But we have this fact to face, that the whole of the large increase of nearly 24,000 tons in 1909 came from sources other than gas-works—divided between coke-oven works, 18,659 tons; shale-works 3420 tons; iron-works 2097 tons; and producer-gas and carbonizing works, 681 tons. To set against these advances, there was an actual decline from gas-works of 942 tons—164,276 tons, against 165,218—compared with 1908; and, to show that this decline was not a mere accidental or temporary circumstance of the year, it may be mentioned that the figures for 1909 are short of those for 1907 by 1198 tons. This may appear to some rather singular, seeing that the volume of gas sold continues to ascend. The chief and most probable explanation must be the smaller quantity of coal that is now required, under new methods of carbonization, for a larger output of gas. If this be the cause, there is no need for regret at the shrinkage of the contribution of gas-works to the output of sulphate of ammonia.

On the whole, during the year, sulphate of ammonia works maintained a good reputation. There were two or three complaints; and they were subject to remedy. There is no need for slovenliness, negligence, or nuisance in connection with sulphate of ammonia plant; and it is a pity that the inspectors should have any ground of complaint, when a little supervision and attention would obviate such occurrences. The use of oxide heaps is increasing for arresting the sulphuretted hydrogen; but in relation to them, inattention in certain cases has resulted in complaint; and yet the steps were not difficult that transferred official dissatisfaction to satisfaction. This makes the offence all the worse.

Through Coalite Glasses.

The British Coalite Company, Limited, have distributed a circular, regarding an issue of £300,000 of 5 per cent. "participating" first mortgage debentures. On paper, never was so certain and lucrative an investment offered to the public; so certain and lucrative is it that the Company are dangling before the eyes of the recipients of the circular a maximum interest of 10 per cent. Ten per cent. on debentures! The debentures are to receive a fixed interest of 5 per cent., payable half-yearly; and they are also to participate up to an additional 5 per cent. in the profits of the Company *after* the ordinary shareholders have received 5 per cent. The offer of this magnificent interest on debentures is sufficient to make the careful investor shy, and inquire why the Company find it necessary to angle with such a big interest. It is airily stated that it will only require £125,000 per annum to pay this amount. Is it going to be any easier in the future than in the past to earn profits instead of deficits? The ordinary shareholders hope it is; but they have already had to swallow, with negative effect, some rather big doses of Coalite prognostications and capital expenditure.

Past and Future.

It is seen that the Company have spent in erecting existing works £194,000, apart from the purchase of land, which has cost about £165,000. We take it that the former sum includes all the rebuilding work that has been proceeding, at periodical intervals after experience, from the very inception of the Company. In view of this reconstruction work, it would be interesting to know what is meant by "the battery has passed the severest tests *over a long period*." It is also observed that the battery has proved itself capable of transforming daily 50 tons of coal, cost-about 13s. per ton, into 225,000 cubic feet of gas of 18-candle power, 38 tons of coalite, and over £20 worth of bye-products. If there is no mistake about these figures, the gas product works out to an average of only 4500 cubic feet per ton, which is not economical working for gas-supply purposes, seeing that 12,000 cubic feet is nearer the mark to-day. Coalite, too, it is declared "has always found a very ready market at 22s. per ton net." We should like to know whether there is any unsold coalite at Hythe; and, if so, why? Also, if there is, whether this is not the case despite the fact that the plant has been, or was arranged to be, shut down for the summer months? While replying to these questions, it would add to our interest to be informed whether there is any undisposed-of coalite at Plymouth. It is also noticed that the actual cost of erecting a battery for 50 tons' daily carbonization, and a gas production of 225,000 cubic feet, is about £5000; and it is asserted the annual depreciation is "very small." Presumably this means that it is hoped the annual depreciation will be very small. But with the reconstruction work that has been going on, we fail to see how fair judgment can yet have been made. However, imagination must have reached the utmost possible point when it is said "each battery *should* pay for itself within one year, and produce subsequent annual profits of at least £5000. To the fact that the Company have not been able to make satisfactory arrangements with gas companies, is ascribed the reason for the absence in the past of "large dividends." The Directors now allege, however, that they have demonstrated to gas companies that it is profitable for them to co-operate; and "negotiations are now going on with over forty companies who are willing to treat on the basis of a working arrangement which will give them a handsome profit, and give to this Company a minimum profit of £5000 per annum per battery." We shall see. But people are getting accustomed to the Company's "negotiations;" more so than to their positive contracts.

Gas in Industry.

In the gas industry we are nothing more than shopkeepers said the (late) President of the Institution of Gas Engineers (Mr. James W. Helps) in his address to the members less than a month since; and the week following this utterance, Dr. E Schilling, in a paper contributed to the proceedings at the annual meeting of the German Association, made use of a very similar remark, when he said that gas suppliers are compelled, like other tradesmen, to work-up their business. He was dealing in his paper with the extensive field that industrial operations offer for the use of gas for heating; and the paper (an abstract of which was published last week) will be found to be very suggestive of the numerous fields that are open for development. In turning attention to the cultivation of the industrial side of his business, it is essential for the gas engineer to make himself acquainted with the trades—large and small—followed in his district, in order to be in a position to recommend suitable contrivances for heating purposes. Success in one instance is bound to be followed by development in the same branch of trade in other quarters. There is no question that the possibilities for increasing the uses of gas for industrial purposes are wide; and electricians have their eyes on the same business. Week by week, devices are seen that electrical inventors produce for, they hope, inducing new business in heating; but they labour under the disadvantage of low efficiency in heating power, and therefore of uneconomy. As Dr. Schilling points out, electric energy is the dearest of all heating agents; and it must again and again be brought to the notice of the public that 1000 cubic feet of gas contain about 560,000 B.Th.U., whereas a unit of electricity can, in the most favourable case, develop only 3428 B.Th.U. Taking the local price of the 1000 cubic feet of gas and of the unit of electricity, it is easy to calculate the thermal value to be realized for any given expenditure.

A Gross Falsehood.

The "Metalite" lamp has been having it all its own way again this last week in the advertising pages of the daily papers; and it can only be imagined that the whole of this grandiloquent writing, with its sprinkling of untruth, is going to be crowned by a prospectus. Though this may be so, certain of the statements must not go unheeded by the gas industry. Page advertisements last week were headed: "Gas Superseded by Electricity: Forty Hours' Brilliant Light for One Penny." The public is not in a position to judge that the "brilliant light" cannot possibly exceed 8 candles (we have misgivings as to whether it would reach that figure), and that the price taken for current is only 3d. per unit. An 8-candle power light is of precious little use for practical purposes. There is, however, ground for a refutation of the deliberate untruth that is contained in these advertisements when it is said that "to thoroughly appreciate the value of this ['Metalite' lamp] invention, it is only necessary to point out that it has reduced the cost of electricity to a figure much below that of gas; and before the latter could compete with that figure, it would have to be supplied at 7½d. per 1000 cubic feet." This is about as bad a falsehood as we have ever seen, even in the many wild flights of our electrical competitors. If gas were at 7½d. per

1000 cubic feet, 1d. would purchase 133 cubic feet. Forty hours' lighting by an 8-candle power "Metalite" lamp is equivalent to 320 candle-hours (*if* the lamp has an efficiency of 1 candle per watt). So that the "Metalite" lamp people are insinuating that, with incandescent gas lighting, an efficiency of only 2½ candles per cubic foot of gas per hour can be obtained. Whereas if 133 cubic feet of gas could be purchased for 1d., with an efficiency of 20 candles per cubic foot (using the bijou or other inverted lamp), the result would be a total of 2660 candle-hours for 1d. At a cost of 2s. 6d. per 1000 cubic feet, can a 20-candle power light be maintained for 33 hours on a consumption of a penny-worth of gas, or, reducing to the 8-candle power basis, for the penny can 82 hours' lighting be obtained? If there are any of our electrical contemporaries in favour of honesty and truth in commercial advertising, they will surely protest against this flagrant instance of distortion. We hope that, if the gas industry is not prepared to immediately unitedly move counteractively in the publicity campaign, that some of the loyal concerns of the gas industry will take sharp action in putting the facts plainly before the public.

The Humorous Side of Jealousy.

Jealousy has its humorous side; and some municipal electrical managements stand in peril of being heartily laughed at for their childish and jealous behaviour towards gas. Some time ago, the Croydon Gas Company advertised on the Corporation tramway tickets; but the Company were not allowed to continue their contribution to the revenue of the Corporation in this way, on the ground that it was against the interests of one of the Corporation departments. Much the same thing has now happened at Ilford. The Ratepayers' Association publish each month a little paper called "The Ratepayer." In its pages, the Council have for some time advertised the virtues—true and fancied—of electricity. The Gas Company have lately entered the paper as advertisers; and it is reported that the courageous and generous Council have withdrawn their advertisement "now that an opponent has been admitted to the advertising pages." What folly! If the Council are not careful, this kind of thing will grow on them; and then it will not be long before they will refuse to allow their cables to continue in the same roads as gas-mains. The ratepayers had better look to it that they get representatives with a little more balance than men who will descend to such an absurdity as withdrawing from a periodical an advertisement because a competitor is permitted to have, as a matter of business, its announcements in the same columns.

Separate Management.

The advertisement in last week's "JOURNAL" for an Engineer and Manager of the Leicester Corporation Gas Department, and the report in our news columns as to the separation of the management of that department from the electrical, raise the question as to the advisability or otherwise of running the two undertakings under one management, as in the days of the late Mr. Alfred Colson. Leicester has nothing to regret in having placed the two undertakings under the charge of their late Gas and Electrical Engineer. He worked with an eye to economy and efficiency, as well as with impartiality. But we do know that his private feelings were not long since that, if he had had the Gas Department only to deal with, and had not had to adopt the impartial attitude that his dual responsibility imposed on him, he could have done better still for the interests of the Gas Department. On the other hand, severance will not assist economical administration; and certain it is there will arise, if not on the surface, below it, a fairly sharp competition between the separated departments. According to Alderman Smith, the Chairman of the Gas and Electric Lighting Committee, it has been alleged that the electricity undertaking has not had a fair chance in competition with gas for lighting purposes; and it is contended by those who so allege that, under separate management, it could do much better. With the allegation we do not agree; and with separate management the keen competition will not be all on the side of electricity. But on the whole perhaps severance is the better way to ensure impartiality at all times. We do not think we should feel disposed to applaud the Leicester Corporation if they put a trained Electrical Engineer in charge of both the gas and electrical undertakings.

The Organization of Labour.

Some interesting details with regard to financial resources were given at the eleventh annual general council meeting of the General Federation of Trade Unions, which was held last week at Swansea. The proceedings included an address by the President, Alderman Allen Gee, who, in the course of his remarks, explained that during the past year six Societies had been added to, and two withdrawn from, the Federation; the net gain for the twelve months being thus four Societies, with 5153 members. Comparing the number of Societies affiliated at the end of the first year with the number to-day, they found that there had been an increase of 102 Societies. The reserve fund at the end of the first year was £1284; and this increased, until in 1908 the fund amounted to £162,210. In 1909, the reserve was drawn upon to meet calls for large disputes, including one on the north-east coast and one in the cotton trade. But he was glad to say that at the end of March this year the reserve fund in hand was close on £100,000; and at the end of June the Treasurer reported to the Executive that it was over £104,000. One branch of the work of the Federation, according to the President, has been to help to mould public opinion and shape legislation for the benefit of the large mass of the workers of the country. A share is claimed in the movement which resulted in the formation of the Labour Exchanges; but as "everybody now knows" these "only mean the registering of the unemployed," the Federation are not likely to rest satisfied with this achievement. In fact, the President already urges that it is clearly the duty of the State to do something further with regard to finding work. "The right to work" is put down by him as being the most pressing subject for legislation, after the Government's present proposals to go a step further on the lines of insurance for the unemployed have come to fruition. Another matter to which the Federation are devoting their energies is the overcoming of the difficulty (for Labour Members of Parliament) created by the decision that no Trade Union funds can, under the present law, be utilized for political purposes. The Federation, like other labour organization bodies, find that there is now no lack of subjects to discuss, and one cannot suppose that there ever will be.

In London Suburbs.

Mr. Charles Carpenter, in February last year, was telling the proprietors of the South Metropolitan Gas Company of the migratory habits of residents in Suburbia; and of how at that time the Company had no less than 18,000 services laid representing capital expended, but producing no revenue, through empty property. In some of the suburban districts, development has been going on apace during the last decade; for in that period 80,000 houses have been built in twenty of the principal London suburbs outside the county, and 32,000 in Wandsworth, Woolwich, and Lewisham. Wandsworth takes the lead with 20,000 houses. The largest amount of building in the outer suburbs took place in Croydon, where 13,000 houses were erected; and in Ilford the progress has been, on an average, 1000 houses a year. Willesden has added 8000 houses in the ten years, West Ham 7000, Lewisham 8000, Leyton 7000, Ealing 6000, Wimbledon 4400, Woolwich 4300. A decline, however, set in in 1907; and builders are beginning to hope that, after three years' depression, there will be a revival. Building booms generally run in cycles of seven years. Development of the kind, however, does not mean all grist to the gas companies, as the new houses attract the people from the old; and the new houses mean fresh capital expenditure.

Sir J. J. Thomson, F.R.S., Cavendish Professor of Experimental Physics in the University of Cambridge, has been elected President of the Junior Institution of Engineers, in succession to Sir Henry J. Oram, K.C.B., Engineer-in-Chief of the Fleet.

The pavilion of the Belgian Association of Gas Managers at the Brussels Exhibition contains some framed particulars in regard to the gas supply of Belgium. There are 190 communes served by 70 gas-works, the annual consumption of coal in which is 840,000 tons, producing rather more than 9000 million cubic feet. The population lighted is 3,054,000; the supply per head being, in round numbers, 3000 cubic feet.

There has just been completed at the Coatbridge Gas-Works by the Whessoe Foundry Company, Limited, a set of four 30 feet square purifiers. From the date of commencement of erection until the last box was working, only eleven weeks elapsed. The plant is to replace the purifiers destroyed by an explosion which occurred on the 10th of February last, photographs of the wreckage of which appeared at the time in the "JOURNAL."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 139.)

ONCE again the American Market with its enormous operations has been the controlling factor. Prices wildly and widely oscillated, according as bull or bear rumours (more or less fabulous) gained credence; but the fair weather prophets had the best of it at the close. All this sort of thing had a disturbing influence, and even the most staid and respectable lines felt it. Business was, of course, at low pressure; and the counter-charms of Henley and Lord's were responsible for several absentees. The opening day was very fair. The gilt-edged class were firm, Railways were cheerful, and the Foreign Market calm. Tuesday began well; but another bad fall in Americans took the rosy colour out. Consols fell $\frac{1}{8}$, and the tendency generally was weaker. Wednesday was dull and heavy, still oppressed by the American incubus. Consols fell another $\frac{1}{8}$; and most of the gilt-edged division and Rails were lower. On Thursday, obedient to promptings from New York, a better tone was set. A recovery was made in the lines which had given way the day before; Consols rising $\frac{1}{8}$. Friday was a quiet day; and, with an upward movement in Americans, most departments were pretty firm. But on Saturday a dull tone was imparted by a bad move in New York. This, after some see-sawing, was quite dispelled, but too late to help the general markets. Consols fell another $\frac{1}{8}$. The Money Market was most irregular. Rates were at first fairly easy, but hardened later on, and then eased away again at the close. Business in the Gas Market was about on a level with the previous week in point of aggregate volume, but it was better distributed through the list. The tendency was good; the bigger issues being especially conspicuous for their firmness. In Gaslight and Coke, the ordinary was not very active but was very strong. One bargain was done at 104¼, but almost the next was at 105, to be followed later on by a mark of 105¼—a rise of ½. In the secured issues, the preference changed hands at from 104 to 104⅜, and the debenture at from 80½ to 81¼. South Metropolitan was dealt in at close figures—within the limits of 121½ and 122. The debenture marked from 80½ to 81¼. In Commercials, the 4 per cent. realized 108½ and 108⅝, and the 3½ per cent. 103½ and 105. Among the Suburban and Provincial group, Alliance and Dublin was done at 81½, Bournemouth "B" at 16⅝, British at from 44 to 45, Brentford old at 254, ditto new at 189 and 190, ditto debenture at 99½, South Suburban at 121¼, Tottenham "A" at 133, and ditto "B" at 113½. On the local Exchanges, Liverpool "A" was dealt in at 219⅞ and 220, ditto "B" at 164½, and Newcastle at 103½—a rise of ½. In the Continental companies, Imperial marked 179¼ and 180, Union 94 (a fall of 1), European fully-paid 24½, and Tuscan 9½. Among the undertakings of the remoter world, Bombay changed hands at 6$\frac{3}{16}$, Cape Town mortgage at 49⅝ and 49¾, Oriental at 139¼, Primitiva at from 7¼ to 7$\frac{1}{16}$, ditto preference at from 5¼ to 5$\frac{15}{32}$, ditto debenture at 97½, River Plate debenture at 98, and San Paulo at 15¾.

ELECTRICITY SUPPLY MEMORANDA.

The New Factory Regulations—Safety and Ignorance—Electricity Users and Expert Advice—Exposed Instructions for Treatment of Shock Victims—Non-Fatal and Fatal Accidents—A Magneto-Ignition Fatality—Toppin's Plan—Wiring Scheme Experience.

A THOROUGH examination of electrical installations in factories and workshops discloses a surprising amount of defective work. This, applying to one class of installation, would certainly do so to other classes; for one class of work would hardly have been picked out for so much blundering and so many inherent weaknesses as have been discovered in factories and workshops—necessitating the new regulations applying to such premises that came into force on July 1 last year. One has only to read the section of the annual report under the Factories and Workshops Act for which the Electrical Inspector of Factories (Mr. G. Scott Ram) is responsible, to see that there has been found to exist an almost general deficiency from the standard set up by the new regulations—a standard that experience suggested should, for safety, be higher than was previously the case. Much time was spent during the year over the coming into force of the regulations; and there has been an evident desire on the part of Mr. Ram and his staff to render as much aid as possible in the way of advice. A number of visits were paid to factories, at the request of the owners, respecting the application of the regulations to the premises; and much time was also devoted to considering and discussing with manufacturers new designs and methods that would conform to requirements.

There is an unspoken reflection in all this upon that much abused characteristic of electric supply—safety. We had almost written "danger." It is said in the report that "owing to its highly technical nature, electricity is a subject that is not easily understood by the ordinary person." We firmly believed this long before the statement came from the pen of the Electrical Inspector of Factories. But, in order to render instruction, Mr. Ram some time since issued an extensive memorandum dealing with each regulation, which, it is hoped, will be of great use for the guidance not only of occupiers, but also of inspectors. Seeing that explanations of the explanatory statements have been asked for, it would seem that the memorandum has not been altogether successful in its mission. With all the regulations, and with all the instruction as to their meanings, it is observed that Mr. Scott Ram still finds "much ignorance" is prevalent among "small users who do not employ electrical engineers on their premises." No doubt it is preferable—electricity being of "such a highly technical nature"—that small users should keep an electrical engineer on their premises permanently standing guard; but if they cannot afford to do this, then the small users, who have not the necessary technical knowledge and experience, should undoubtedly adopt the counsel of the Electrical Inspector, and seek proper expert advice, and not rely merely on a bell-hanger or house decorator. But it is not only among ignorant users that expert advice is required, but among men who are supposed to be qualified electricians. Numerous accidents are reported; and of them thirteen were due to short-circuits by men engaged in working on live switchboards at low or medium pressure, and in several cases the resulting injuries were extremely severe. Most of these accidents appear to have been due to the want of elementary precautions. One was due to the "electrician" taking measurements of the switchboard with a steel rule. There is a stinging rebuke by Mr. Ram in his comment: "People who make this particular variety of accident would probably also look for a gas escape with a match." If there is such carelessness on the part of electrically-trained men in one place, it is pretty certain that similar carelessness will be found in other places where factory and workshop inspectors do not penetrate, and where there is no real supervising authority.

Further regarding the question of "safety," it is advised that printed notices should be prominent where danger may lurk. But these should not be relied upon solely for protection. It is a singular thing that electricians do not like warnings of any kind to be seen in connection with electricity, although it is classed as a "dangerous trade." When the new regulations were being considered in draft form, objection was even taken to the exhibition, though highly essential, of illustrated cards in factories, showing the method of treating persons suffering from electric shock, on the ground that this would unnecessarily frighten work-people, and retard the use of electricity. Mr. Ram has found no evidence to support the contention. On the contrary, he has seen notices exhibited by conscientious employers; but some of them carry warning a bit too far. In one case, for example, Mr. Ram found a skull and cross-bones above the words "Sudden Death." It is not pleasant to be for ever reminded that "in the midst of life we are in death." Such a constant reminder does not assist to make a joy of one's occupation. Besides, it is unnecessary. It is quite sufficient to have a prominent warning at danger-points; and illustrated directions as to treatment for shock should be regarded as indispensable in all factories in which electricity is employed.

Although the new regulations came into force on July 1 last year, and consequently there must earlier in the year have been much work going forward to bring about compliance with them, there is no noticeable difference in the number of electrical accidents recorded in the report for the whole year. Omitting the non-electrical accidents, and taking only the electrical ones at generating-stations and sub-stations, it is seen that at company and local authority stations there were 54 non-fatal accidents and 4 fatal ones; while at privately owned stations, there were 32. The total number of accidents is practically identical with that of the previous year, though somewhat fewer occurred in public stations, and more in private ones. Against the four fatalities of the year, only two were recorded the preceding year. When we turn to the statistics as to reported electrical accidents in factories, engineering works, &c., other than electrical generating-stations and sub-stations, it is seen that there were no less than 249 (27 more than in 1908) non-fatal electrical accidents and 8 fatal ones (4 less). Of the accidents with portable apparatus, 23 were due to burns from short-circuits or shock when handling flexible wires, which are frequently insufficiently protected against damage, to which they are particularly liable in factories and engineering works. Twelve were due to short-circuits at connectors when plugging in or out; the operator getting his hand severely burned. Three accidents were due to shocks from portable lamps—one being fatal, and this on a 250-volt alternating current! The danger from shock to men when working at heights is illustrated by a non-fatal one, in which serious injuries occurred to the victim by falling from an iron platform 13 feet from the floor. In this case the pressure was 105 volts only. A similar accident was due to a portable breast drill. The accidents from unprotected conductors include six fatalities. One of these occurred on a 230-volt single-phase alternating system. A lighting wire, having no protection beyond the ordinary covering of insulating material, was attached to a wooden beam. A sling had been put round the beam, and a block and tackle were suspended therefrom for lifting an iron plate weighing ½ ton. The chain cut through the insulating material of the wire, and the whole tackle and iron plate became alive. Two men received shocks—one being killed. The danger to workers from electric light extinction is exemplified by the case, in the Bristol district, of a man falling down a ship's hold, through the sudden collapse of the electric light. The point is well worth consideration by employers, many of whom who use electrical energy know something about the trouble caused by machine and works stoppage through cessation of the supply of energy from the town service.

There is one fatal accident not classified as electrical, but in

which electricity was concerned, which will be particularly interesting to gas engineers. It occurred in connection with the magneto-ignition of a gas-engine. The engine had stopped through the failure of the ignition. The attendant was slackening the bolts of the ignition plug, in order to withdraw it for examination, and had partially removed it when, accidentally, he knocked against the lever of the magneto machine, causing a spark at the plug, and the ignition of the explosive charge in the cylinder, which, finding a vent round the partially removed plug, severely burned him. The obvious precaution of disconnecting the wire between the magneto and the plug before slackening the bolts had been neglected.

Turning to matters of another character, we have that, for station engineers, perennially interesting question of the charges for electric supply brought before us in an article (published by the "Electrical Review") by Mr. W. A. Toppin, headed "Systems of Charging and Metal Filament Lamps." The first sentence of the article is pristine in the matter of its intelligence. "Electricity supply authorities have universally felt the advent of the metallic filament lamp." No one has said they have not; no one is better aware of the fact than electricity supply authorities themselves; and they do not want to be publicly reminded of the fact. Considering the causes of the metallic lamp effect, it is pointed out that the electricity supplier sells energy and not light; and therefore, unless a consumer trebles or quadruples the amount of light he obtained with carbon lamps, the quantity of energy he uses will be decreased by using the new lamps. The small lighting consumer becomes hardly worth supplying, owing to his modest consumption of energy. The low loads at which his meter normally works are more difficult to measure accurately than the higher loads demanded by the larger consumer. To get over this difficulty, several towns have dispensed with meters for this class of consumer. To bring up the revenue, station engineers are obliged to rely on increasing the number of the consumers; and this means increased expenditure on services and cables. The capital charges on the undertaking are thus increased. From this indication of points in the article, it is clear that Mr. Toppin thinks the situation is not altogether a rosy one. But he has a plan for giving relief, not only to the station engineer, but to the British lamp manufacturer, and so away with metallic filaments of German production. The plan seems to be this, that the carbon filament lamp costs less than the metallic filament, and has a long life; and as the high voltage metallic filament lamp does not burn equally well in any position, and does not stand frequent handling and much vibration, the consumer will prefer the carbon lamp that has not these defects. Mr. Toppin wants to make it a matter of indifference to the consumer whether he uses carbon filament or metallic filament lamps, so as to encourage the use of the former. He thinks this is to be effected by the system of a fixed annual or quarterly charge, and 1d. per unit for all electricity used. We do not follow the argument as to how this will cultivate favour for carbon filament lamps; but Mr. Toppin seems to think it will, so that it must be all right.

Of the making of plans to stimulate consumption, there is no end. A report on a scheme has just come from Poplar; but it does not read as though there is any great enthusiasm over the matter, or over the experience on which certain recommendations are based. It is evident that the experience does not support the Electricity Committee in striking out boldly in the same direction, but only to make further tentative efforts. In March, 1909, the Council approved the wiring of 25 houses, at a tariff of 12½ per cent. on the cost of installation to cover interest, depreciation, and repairs, with a further charge of £4 per annum per kilowatt in respect of the capacity of the lamps connected, and £1 per kilowatt for heating, &c., *plus* ½d. a unit in each case for all current consumed—lighting in cellars, lavatories, &c., not extensively used at the time of maximum load, being charged at the same rate as for heating. The Electricity Committee report that the results "appear" to have been satisfactory; and they are of opinion that this class of installation may be usefully extended. Appear! Are the Committee so uncertain that they cannot speak a little more definitely? It is suggested that a similar system of charging should be adopted in respect of lighting business premises; but in these cases, while the charge for consumed current will remain the same, it is proposed to fix the rate per kilowatt installed at £13 for inside lighting and £6 10s. for outside arc lighting—the latter demand coming only partially on the peak of the load. With regard to power consumers, it is intended to establish a general rate of £4 per kilowatt demanded, *plus* ½d. per unit for all current consumed (discarding the rate of £3 per kilowatt and 8d. per unit), and to offer rebates to large consumers. The Committee only recommend that authority be given to wire a certain number of premises, not exceeding 50, for domestic and business supplies, on the terms and conditions here stated, at a cost not exceeding £20 for any one installation; also that the proposed rate for direct-current power be £4 per kilowatt demanded, with ½d. per unit for the current supplied, subject to rebates. The Council ought not to concur in any such proposal until the Committee can use a more definite word than "appear."

A banquet is to be given early in November, at the Savoy Hotel, to the five Past-Presidents of the Chemical Society (Professor William Odling, Sir Henry E. Roscoe, Sir William Crookes, Dr. Hugo Müller, and Dr. A. G. Vernon Harcourt), who have now attained their jubilee as Fellows of the Society.

NOTES FROM WESTMINSTER.

THE great feature of the week has been the fight over the Standard Burners Bills, about which more in succeeding paragraphs. The Liverpool Gas Company, who have now, through their exceptional circumstances, a Bill all to themselves, commenced their innings on Friday afternoon. There is not much more contested Private Bill work of any kind to receive attention; and if there were, there would be very little time to give to it, seeing that talk in the lobbies is as to it being almost certain now that the House of Commons will rise some time the last week of this month for a holiday period, and will reassemble for an "autumn" session early in November.

Standard Burner Bills. By the time these "Notes" are published, we shall be at the final stage of the Standard Burner Bills, which will be historic in the struggle of the gas industry for fair and open treatment in the conduct and the control of their business. There is only the special case of the Liverpool Gas Company to be considered now (with it a start was made on Friday); and then the Committee will give their decision on the whole of the measures. Though the number of opponents had decreased considerably, there was no lessening of the mass of evidence to which Sir Henry Kimber and his colleagues had to listen; and though to those who have followed the struggle from the beginning, there was nothing really new in the several features of the case *pro* and *con*, one could not help feeling, throughout the proceedings from Monday morning to Friday afternoon, that there was something important at stake, and interest was kept at high level the whole while. The manner in which the case was conducted for the promoters was worthy the big cause; and let it here be said that the organization of the case by Messrs. R. W. Cooper and Sons, and their watchful care from the very introduction of the Bills to the present time, deserve the highest praise. They and all associated in the promoters' case have worked hard and persistently for victory, believing fully in the justice of what they have asked for; and we hope next week to record that the laurels are completely theirs. The Hon. J. D. Fitzgerald, K.C., Mr. Honoratus Lloyd, Mr. C. C. Hutchinson, and Mr. A. M. Paddon were Counsel for the Bill. On the opposing side, representing various bodies, were Mr. Balfour Browne, K.C. (Mersey Docks and Harbour Board), Mr. Ram, K.C., Mr. Talbot, K.C., and Mr. Courthope Munroe. The legal forces were strong; and not less so the expert representation that had been chosen on behalf of the promoters. Naming them in the order in which they were called, there were Mr. Charles Carpenter, Professor Vivian B. Lewes, Mr. W. J. A. Butterfield, Mr. Corbet Woodall, Mr. Alex. Wilson, Mr. H. E. Jones, Mr. William Cash, Mr. W. C. Young, Mr. C. E. Botley, and Mr. Robert Beynon. Mr. Carpenter, Mr. Butterfield, and Mr. E. H. Stevenson were in close consultative attendance on Counsel. The opposing bodies called Mr. T. S. Berry, Mr. Benjamin F. Meadows, Mr. A. G. Smith, Professor Percy Frankland, Mr. Isaac Carr, and Mr. J. G. Newbigging, upon the three latter of whom fell the full force of the promoters' resistance.

We heard once more of the injustice of the old burner to those gas undertakings supplying grades of gas other than 16 candles; we re-traversed the history of gas supply from the time when Parliament gave gas suppliers the right to a burner that should show the maximum illuminating power of the gas; we heard how Parliament had consistently maintained that principle in all their dealings with gas suppliers; we heard, too, how the old burner distorted the differences between readings by it and by the No. 2 burner through its unsuitability with gases other than that for which it was made; and there was only one dissentient—Mr. Isaac Carr—to the No. 2 being the most accurate burner for obtaining relative results with all grades of gas. But there was the "contract" between gas suppliers and consumers, in which the opponents would insert the test-burner as a fixed condition, only subject to revision by giving compensation to flat-flame laggards. For their sake, and theirs alone, gas companies must be tied hand and foot, to ensure them this compensation, while the gas consumers of local authorities who adopt the burner must take their chance of getting something, unless Parliament positively commands that any profits are utilized for the benefit of the undertaking and of the consumers. Little, however, was said about the imposition of a calorific power test. So we went on over the ground that has been traversed again and again, and in every particular, but a few weeks since in the Lords. We will not attempt to review it all here. Comment is made in our editorial columns on the opposition case; and touching that case, Professor Frankland, Mr. Carr, and Mr. Newbigging will not soon forget the trenchant cross-examination that they underwent at the hands of Mr. Honoratus Lloyd, whose powerful speech, in reply on Bills Nos. 1, 2, and 3 stands as an unanswerable case in favour of the new standard burner. It will be found fully reported in our "Parliamentary Intelligence;" and it should be read by all gas men. The desire of the Committee to thoroughly understand the use of the burners led them on Thursday night to the Craven Street testing-room of the London County Council, accompanied (among others) by Mr. Charles Carpenter, Mr. Isaac Carr, and junior Counsel (Mr. Hutchinson and Mr. Courthope Munroe).

Trading Liberty for Glasgow. As was mentioned last week in the concluding paragraph of the "Notes" referring to the proceedings on the Glasgow Bill, the Corporation Gas Department are thoroughly satisfied with their Bill as it now stands. Its position has been, between the House of Commons and the House of Lords, materially altered, to the commercial advantage of both gas undertaking and consumers. There is no grief on the part of the Gas Department, and we think it may be said of the major part of the Corporation, that there has been a withdrawal of the (almost unexercised) liberty to take from the profits of the gas undertaking and distribute them among the ratepayers, who, *quâ* ratepayers, have never been asked for a penny-piece in support of the concern. But there is rejoicing that the rigidity in regard to charges that existed as the Bill passed from the House of Commons has given place to greater flexibility, as this affords the department trading freedom that must contribute to the maintenance of business. As was stated in the "JOURNAL" at the time of the Commons Committee's decision, we regarded the price limitations put upon the department as exceeding the bounds of fairness and propriety in relation to a trading concern in competition with other commodities. However, we are sure that the Glasgow Corporation are now glad they did not sacrifice the measure as it left the Commons; for they have to-day a Bill under which they can conduct the gas undertaking in the best interests of the consumers. The general terms of the decision in the House of Lords were published last week. When clauses were considered on Monday, the only two matters of importance to claim the attention of the Committee were the provisions as to discounts up to 10 per cent. for prompt payment and 15 per cent. for large consumption, and regarding the formation of a reserve fund. A little supplement was made to the discounts clause at the instance of Lord Robert Cecil, K.C., whose point was concurred in by Mr. Balfour Browne, K.C., for the promoters. It arose thus: A previous clause enacts that there should be an equal rate of charge for public lighting purposes; and this conflicted with the discounts clause, inasmuch as there was an opening for a reduction to the large local authorities which would not be shared by the small local authorities. Obviously, it would not have been fair for the local authorities to be treated differently. Lord Robert's suggestion was that the discounts clause should be prefaced by the words, "Subject to the provisions of sub-section 4 of section 26 of this Act." This was agreed to; and in this simple way was effected the re-establishment of equality. The terms of the reserve fund were also agreed to; the Corporation being allowed to accumulate such a fund up to 10 per cent. of the borrowed moneys outstanding, by appropriations of ½ per cent. per annum upon the money outstanding for the time being.

Out-District Prices. The Swansea Gas Company and the Swansea Rural District Council were in a friendly frame of mind last Tuesday when the Confirmation Bill which includes the Company's Order came before Lord Donoughmore's Committee. The sole point in dispute was the territorial boundary in respect of gas prices; and the Committee were informed at once that the parties had arrived at terms of peace, so that their Lordships would not be troubled, beyond bestowing their approval. The agreement provides for the price of gas within a mile of the existing borough boundary being the same as that charged within the borough. Outside the mile limit, the price is not to exceed the borough price by more than 4d. per 1000 cubic feet, except Oystermouth, with which the parties were not concerned. Omission to extend the gas-mains to Birchgrove within a year of the confirmation of the Order is to give the Council liberty to put into force their electric lighting powers there. Other extensions of mains into the outside districts are arranged for. On Wednesday, there was ratification by the Committee of the proposals, and approval of the Confirmation Bill.

"Black" Smoke and Gas-Works. The London County Council have failed in inducing the Local Legislation Committee to strengthen their hands, in administering the law as to the emission of smoke from factories, by expunging from existing enactment the word "black" now appearing before smoke, and so exposing manufacturers to attack in the matter of nuisance where they have hitherto been free from it. The case of the County Council lacked evidence as to the existence of nuisance that would justify the Committee in making the change proposed. The Committee, as a matter of fact, did not find that, in the case of the gas companies, there had been any testimony pointing to nuisance that would justify them in laying the Companies open to any more rigorous supervision or frequency of attack than at present. Mr. Fitzgerald, K.C., had, indeed, to admit that the South Metropolitan Gas Company had never been proceeded against at all during the past forty years; but what would happen if they had not the protection of some term defining and giving a character to the smoke, can hardly be said. There would no doubt in future have been a magnificent display of energy, and a grand conflict of testimony, had the Committee accepted the proposal for the excision of the defining word "black." The Committee have declined to interfere with the *status quo*; and "black" smoke remains the evidence of a violation of the law.

Cambridge Water. In the "Notes" published on April 19, reference was made to the proceedings in the House of Lords on the Cambridge Water Company's Bill. The Corporation did not gain any notable laurels then as the result of their opposition, as it was apparent to all that the Water Company have been doing (and their present plans are directed to the same end) all possible to serve Cambridge well. The best expert testimony that could be procured by the Company confirmed their actions. But the Corporation appear to have been exerting themselves to, in some way, get the Company into a net through the medium of the Bill. When before Sir Luke White's Committee recently, they asked for a suspensory clause, to pave the way for a Purchase Bill of their own. They could not have gone to work in a better manner than they have done in an endeavour to depreciate the value of the Company's property; and the suggestion as to a suspensory clause, if it had been adopted, could only have interfered with the progress of the Company in their service to the town. The Committee would not agree to the insertion of such a clause. It was evident the Committee saw that the Water Company had fulfilled their obligations in the past, and that their new works scheme purposed putting them in a position to do the same in the future; and therefore the only thing the Committee did was to put certain limits on the Company's financial proposals. Back-dividends were restricted to six years; a provision as to charges for high service was deleted; and regarding proposed increases in the scale of water charges, the Company were ordered to put in the Bill certain terms as to the date from which the rates should be chargeable—the Committee considering that, after the Company had expended £25,000 of the extra capital, they should be entitled to charge the whole of the increased rates. As to new capital, £200,000 was allowed; the Company's suggestion being £213,000. Regarding debentures, the Committee were of opinion that none should be issued bearing more than 4 per cent. interest without being put up to auction.

LOST DIVIDEND WARRANTS.

By H. D. ELLIS.

THE case of "Thairlwall *v.* Great Northern Railway Company," recently decided in the King's Bench Division, on appeal by the defendants from a judgment in the Clerkenwell County Court, should possess interest for all Directors and Secretaries.

In brief, the case was as follows: The plaintiff was a holder of certain stocks of the defendants, the dividends upon which are from time to time paid by warrants in the usual manner. With the sanction of the shareholders, these warrants are sent to them through the post, addressed to them at their registered addresses. In pursuance of this practice, such a warrant was addressed to the plaintiff last February. It failed to reach him, and has not been found since. After an interval of three months, the plaintiff applied to the defendants for a duplicate warrant. The defendants demanded an indemnity from the plaintiff, as a condition precedent to their issuing such duplicate. The plaintiff refused to give the indemnity; and the defendants thereupon refused to issue the duplicate. The plaintiff thereupon brought an action in the County Court to recover the amount of the dividend. The County Court judge decided in favour of the plaintiff; and the defendants appealed.

In delivering judgment in favour of the defendants, the Appeal Court (as reported in "The Times Law Report," June 20) held

(*a*) That the warrant was a cheque within the meaning of the Bills of Exchange Act, 1882.

(*b*) That in accordance with the principle laid down in "Norman *v.* Ricketts (3 "The Times Law Reports," 182), the sending of the warrant by post was payment. The only obligation on the Company was to send plaintiff a dividend warrant, and, having done this, they became discharged.

The dictum of the Court in paragraph (*b*) may perhaps be imperfectly reported. For if the posting was "payment," and the Company were "discharged," then the Company were under no liability whatever to the plaintiff; and they would not be justified in paying him the amount of the dividend whether in consideration of an indemnity or otherwise.

The dividend warrant bore upon the face of it the usual notice to this or the like effect: "This warrant will not be honoured after three months from date of issue unless specially endorsed for payment by the Secretary." The three months had elapsed prior to the plaintiff bringing his action; and the warrant was dead. The notice upon the face of it was the Company's own warranty that it was dead. A banker who honoured it after the expiration of the three months would be liable to make good the amount. In demanding an indemnity from the plaintiff, the Company were asking to be guaranteed against a liability which could only be created by their own *laches*—viz., the revival by their own act of a dead "chose in action." The shareholder had not been guilty of any *laches*, and he was absolutely powerless in the matter—powerless even to prevent the Company wrongfully or negligently reviving the warrant.

There is little likelihood of the case being carried to a higher Court—though Lord Halsbury's judgment in the House of Lords on appeal might be interesting reading. But anyhow, as the matter stands, Boards of Directors may extract one wholesome admonition from it; and that is, that they should not harass shareholders with needless and irritating red-tape. By-laws and regulations, in addition to being in harmony with Public and Private Acts, should be equitable and reasonable, and not oppressive and vexatious. It is to be feared a good many companies—some very old and very respectable—cling to antiquated prescriptions which should long ago have been swept aside.

THE QUALITY OF LONDON GAS.

We have given from time to time in the "Journal" reviews of the results of the testings made by the Gas Examiners appointed by the London County Council on the gas supplied by the three Metropolitan Gas Companies. The last of these reviews appeared in the issue dated Oct. 12, and carried the information as to these testings down to the end of the third quarter of 1909. In view of the references made, in the course of the evidence given last week before the Committee of the House of Commons on the Standard Burner Bills, to the calorific power of the gas supplied to London, it seems a fitting opportunity to carry down to a recent date the information given in the "Journal" on the results of the Metropolitan gas testings. In this article, allusion will be made to the fourth quarter of last year, and the results obtained compared with those for the corresponding quarter of the two preceding years. In next week's issue, similar information will be published for the complete years (1907-1909) and in regard to the first half of the current year.

The testings of illuminating power for the fourth quarter of the last three years have given results of which the average is shown for each of the three Metropolitan Gas Companies in the appended table. (Table I.) The precise period to which the 1909 figures refer is the fourteen weeks ending Jan. 1, 1910; while the figures for 1907 and 1908 are for thirteen weeks ending Dec. 28 and 26 respectively:—

Table I.—*Averages of all Testings of Illuminating Power for the Fourth Quarter of the Year* [*Candles*].

Burner	No. 2 Metropolitan Argand.			Flat-Flame.		
Year	1907.	1908.	1909.	1907.	1908.	1909.
Gaslight and Coke Company	16·70	16·96	15·82	11·50	12·00	10·10
South Metropolitan Gas Company	16·45	16·71	16·12	10·96	11·32	10·38
Commercial Gas Company	15·01	14·85	14·57	8·58	8·90	8·75

The minimum results of any one day's testings with the argand burner in the fourth quarter of 1909 were, for the Gaslight and Coke Company 14·03 candles, for the South Metropolitan Gas Company 13·93 candles, and for the Commercial Gas Company 13·00 candles. These results are of importance, because the Companies are liable to incur forfeitures if the illuminating power of the gas, on the average of three consecutive days' testings, is found to be more than half-a-candle below the prescribed illuminating power. The latter was in the quarter to which these results refer, 14 candles for the South Metropolitan and Commercial Gas Companies, and 16 candles for the Gaslight and Coke Company; but actually the last-named Company were, by agreement with the London County Council, working to a 14-candle standard of illuminating power by way of anticipation of the drop from a 16 to a 14 candle standard which the Company's Act of 1909 sanctioned, with effect from Jan. 1, 1910.

Table II.—*Summary of Testings of Calorific Power (Net) for the Fourth Quarter of the Year* [*Calories per Cubic Foot*].

—	Average.			Maximum.			Minimum.		
	1907.	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.
Gaslight and Coke Company	132·7	132·0	125·5	143·4	158·4	139·6	122·6	118·3	116·0*
South Metropolitan Gas Company	133·0	133·9	132·1	152·2	151·3	152·7	127·1	127·2	122·0
Commercial Gas Company	127·3	124·1	125·0	138·6	135·4	133·9	116·2	116·7	116·2

* There is a doubt as to whether this is the minimum result for the quarter, as is pointed out in the text of this article.

The average maximum and minimum results of the testings made for calorific power are shown in Table II. for each of the three Companies for the fourth quarter of the three years. The figures refer to the net calorific power stated in calories per cubic foot. They may be converted into British thermal units per cubic foot by multiplying by 4 (if great exactness is required, by 3·968); and the gross calorific power, which has not been stated in the returns published by the London County Council prior to the last few weeks of 1908, may be found approximately by adding 15 to 17 calories to the net calorific power. In the fourth quarter of the year 1909, the average gross calorific power returned was, for the Gaslight and Coke Company 15·4 calories per cubic foot higher than the average net calorific power, and for the South Metropolitan and Commercial Gas Companies 16·6 and 15·4 calories higher respectively. The minimum return of gross calorific power for the Gaslight and Coke Company for the same quarter was 129·9 calories. In regard to this and the minimum net calorific power of 116·0 calories recorded in Table II., it should be pointed out that for one week of the quarter the London County Council omitted to report any minimum figures for the calorimetric testings—an omission which may be taken to imply that an improbably low result had been reported from one testing-place, and the Council did not feel justified in publishing it. The minimum returns of gross calorific power for the South Metropolitan and Commercial Companies were 137·7 and 132·3 calories per cubic foot respectively.

Table III.—*Summary of Testings of the Sulphur in London Gas for the Fourth Quarter of the Year* [*Grains per 100 Cubic Feet*].

	Average.			Maximum.		
	1907.	1908.	1909.	1907.	1908.	1909.
Gaslight and Coke Company	41·5	36·3	33·4	81·6	52·2	58·7
South Metropolitan Gas Company	46·5	47·2	38·6	84·0	98·7	75·7
Commercial Gas Company	30·6	30·4	30·6	47·6	47·3	49·9

The results of the testings for sulphur other than in the form of sulphuretted hydrogen are summarized in Table III. They are interesting, as showing that the somewhat high returns which characterized the years immediately following the abolition of lime purification in London were due to temporary causes. Even the South Metropolitan Gas Company, who have not the benefit in this respect which is obtained by the admixture of carburetted water gas with coal gas, were able during the fourth quarter of 1909 to work to as low an average as 38·6 grains of sulphur per 100 cubic feet of gas.

We will reserve further comment on this and other figures quoted in this article until the similar figures for the whole year and for the last six months are given in next week's issue.

FLOODING OF THE GAS-WORKS AND INTERRUPTION OF THE GAS SUPPLY AT ZÜRICH.

It was mentioned in the "Journal" for the 21st ult., that the gas lighting of parts of the City of Zürich had been affected by the floods which visited Switzerland last month. The damage and inconvenience appear, however, to have been considerably greater than was then indicated, since the whole of the gas-works was flooded on June 15, and work could not be resumed fully until the 18th of that month. The following details of the catastrophe are taken from a report in the current number of the "Journal für Gasbeleuchtung."

The ground level of the Schlieren Works at Zürich was raised, at the time of their erection, about 32 inches above that of the surrounding land, in order to diminish the danger through the flooding of the Limmat Valley, which occurs when the water rises in the River Limmat and the Lake of Zürich. The gas-works, it will be remembered, from the description which is published as a *brochure* from the office of the "Journal," and an account of the extensions given recently in our columns (see "Journal," Vol. CX., pp. 371, 426, 490), is situated between the dam which was constructed to confine the river to a definite course and the raised roadway known as "Industrie Strasse." The bank on which this roadway runs is a solid construction without tunnels or culverts for the passage of water from one side of it to the other.

It appears that on the 15th of June the water overflowed from the River Limmat above the end of the confining dam already mentioned, and swept down the valley between the roadway and the river dam. Had there been culverts by which it could escape under the roadway, the damage done would have been considerably less serious. It was noticed about ten o'clock on the morning of June 15 that the water in the river was rising to an abnormal height; but no serious flooding was then anticipated. By 12.30, however, the whole of the gas-works site was flooded to a depth of about 12½ inches, and the cellars and underground channels containing works' plant were filled with water—in some cases to a depth of 68 inches. The channels in which the coal conveyors were situated were flooded, and the water entered the main flue of the retort-furnaces and caused the fires to be nearly extinguished. It also blocked the flues from the boilers, and, by so cutting off the supply of steam, interrupted the working of the works' power station for some time. When the flood occurred, there was about 2,140,000 cubic feet of gas in the holders.

The cellars on the gas-works are, as far as possible, connected with the drainage system of the works; and it will be remembered that special provision has been made for pumping the drainage water into the river. In the extensions of the works which were described in the "Journal" recently, reference was made to the fact that a new pumping-station had been established, with a Sulzer's dirty-water pump of 9 inches bore and a capacity of 1320 gallons per minute, for pumping out the drainage system in times of flood of the river, so as to avoid the flooding of the gas-works which had occurred on two occasions since their construction. It was believed that this provision had met all risk of further flooding of the works. But the floods last month were caused not by the return of water from the river through the drainage

system or by the rise in the level of the underground water, but by the overflow of water from the river above the point at which the confining dam terminates. The interruption of the working of the power station naturally prevented the water being pumped out quickly after the flood had occurred. Moreover, the flood water, coming down in such amount and in this manner, carried with it quantities of mud and *débris*, which blocked all the channels and the suctions of the pumping plant. The following day, however, locomotives and hand pumps were put to work and rapidly emptied the water from the boiler and engine house, and the main flue of the retort-settings. By mid-day, it was hoped that the retort-furnaces could be re-started; but it was found that the mud had partially blocked the flue, and the latter had to be cleaned before the furnaces could be recharged with safety. As soon as the flue was cleared, the retorts were charged; the coal being brought into the bunkers over the settings by hand, as it was not till mid-day on June 17 that a portion of the coal-conveying plant could be again brought into action.

Thanks to the large store of gas in the holders at the time of the catastrophe, the supply to the town was not affected on the 15th ult., though on the evening of that day only one-third of the public lamps were lighted by way of economizing the store of gas, and the supply was cut off to the outlying suburbs. Notices were circulated the same day from house to house asking consumers to curtail or stop their consumption of gas; but apparently they had little effect. The next day notices were circulated warning consumers to shut off their gas-taps, as the supply of gas would be interrupted. The public gas-lamps throughout the town could not be lighted on the nights of the 16th and 17th ult. On the evening of the 17th, however, the gasholders had been so far re-filled that the distribution could have been resumed; but it appeared unadvisable to resume the supply at night-time, and the interruption consequently continued until eight o'clock the following morning. Consumers were then warned that gas would again be supplied to the central districts of the town, and by eleven o'clock to the suburbs. Thanks to the warnings issued, no accidents from escaping gas have been reported. The actual duration of the interruption of supply to the town was about 36 hours. The damage done on the gas-works by the flood is estimated at about £2000.

The question of the extension of the dam of the river further up stream, so as to avoid a repetition of the occurrence, is being considered by the Municipal Council; and the work will no doubt shortly be put in hand.

GAS ASSOCIATION AFFAIRS IN AMERICA.

[Communicated by an Engineer in the States.]

Never have the Association activities of the gas men in America seemed as great as now. The gas journals are filled with notices of meetings to come and accounts of meetings that have been. So prolific are these meetings that what little time the average American gas engineer devotes to writing is occupied in the preparation of a paper for some meeting. Men who have a mission to perform, such as the education of the gas fraternity to the value of calorimetry (now the self-imposed task of Mr. J. B. Klumpp) or to the importance of proper illumination, and how well the new forms of gas-lamps lend themselves to this end (a subject to which Mr. Norman Macbeth has been devoting himself for some time) —men of this class can almost spend all their days in journeying from State to State, from one convention to another.

Now, in addition to these Local Associations meeting once a year, the gas men are beginning to follow the example of their electric and their illuminating engineering *confrères* in organizing Local Sections with monthly meetings. One reason for the quite phenomenal growth of the Illuminating Engineering Society has been its division into Local Sections. These sections (located in New York, Philadelphia, Chicago, and Boston) have in their monthly meetings been more typical of the Society's life and work than have been the annual conventions. The healthy rivalry between the sections, and the continuity of interest maintained by the monthly meetings, have paved the way each year for a rousing annual meeting. The section plan is also in successful operation in the National Electric Light Association; and it is their idea of forming "Company Sections" that is now being adopted by the National Commercial Gas Association. Under this scheme, the employees of a gas company assemble and form the "..... Company Section of the National Commercial Gas Association," draw up a set of bye-laws (which must be at once approved by the Parent Association), and proceed to hold (usually) monthly meetings. Experience, apparently, shows that these Local Sections benefit the company by sharpening the wits, and thereby increasing the value, of its employees, through mutual association, and benefit the Association by increasing the number of men interested in its work. Also, that the idea of belonging to some large Association is more attractive to the average man than just being a member of a club of company employees. I say "apparently," for the Local or Company Section has not been in existence long enough to speak with any certainty about its permanency. However, there seems no reason to doubt that by the organization of these Company Sections, the National Commercial Gas Association will be greatly aided in maintaining its membership at the high level of numbers and interest evinced by the New York meeting last December.

Just what effect this rapid development of the Commercial Gas Association into a strong national society will have upon the growth of the American Gas Institute, remains to be seen. It would appear quite probable that certain commercial men and traders belonging already to a District Association would not care to be in two national organizations, and would choose the Commercial Association in preference to the Institute. There is a disposition in some quarters to find great fault with the Institute—claiming that it has not justified its existence; and there are those who would like to see the Commercial Gas Association assume the primacy in American affairs. However, a careful comparison of the work done by the three Associations from whose merger the Institute was formed, with that put out by the Institute itself, will show convincingly that the latter has earned fully the right to live. Undoubtedly, it has not done all that was hoped or all that was easily possible. Its neglect of commercial subjects gave ample justification for the formation of the Commercial Association. The Institute has suffered a little from the high quality of work it has done. Such reports as those made by the Committees on uniform methods of taking candle power, on electrolysis, on units of light, on calorimetry, on revision of the "Question Box," on the "Bureau of Information," involve so much sacrifice on the part of the little band of willing workers to which the Institute owes so much, that it is not strange that such reports are not forthcoming every year. On the other hand, the preparation of an interesting commercial programme does not entail any original research or long experiments, but merely a description of methods found successful in managing an office or selling gas. The average commercial man feels better able to make a contribution to his meeting than does the Institute member, for the more knowledge the latter really has, the more modest he is, and the less inclined to talk in the presence of the leaders of his profession. Of course, this is a mistake which militates against the young engineers as well as against the general interest taken in the Institute's meeting. More and more, the latter's work is getting to be the product of some engineer who has been able to utilize the technical staff of a large company or a syndicate of companies. Such work affords, free of charge to each member of the Institute, information otherwise expensive to obtain. And yet there are members who do not think that the Institute is benefiting them to the extent of their annual dues of $10. Such members apparently forget the "Bureau of Information," which stands ready to answer their questions; and, undoubtedly, many mistakes are made daily costing ten times the membership dues, because of the failure to ask these questions.

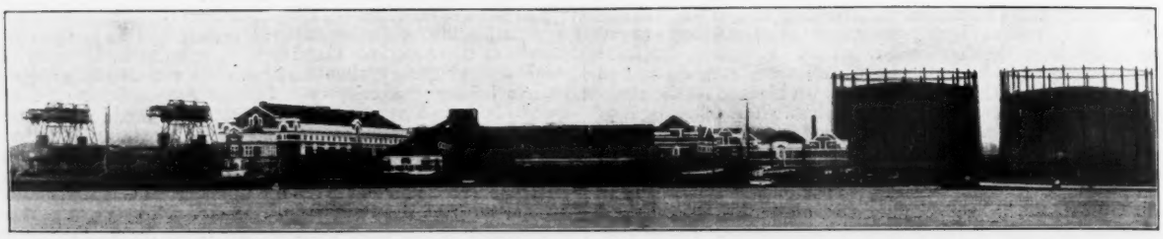
A feature of the Commercial Association is their monthly "Bulletin" of sixteen pages, to which all members are asked to contribute. This is supposed to be "getting something for your money;" and some persons think that a similar publication by the Institute would be welcomed by its members. It would appear as if the gas journals rendered such a bulletin unnecessary. But possibly human nature is such that getting something for nothing would be pleasing to the average member, even though that something could be obtained from the gas journal at more frequent intervals, and without extra expense to him; for, of course, a gas man who does not read a gas journal is barred from any consideration whatever.

As to the further relations of the Institute and the Commercial Association, it seems now that any close union of the latter with the former is not at present possible. This being the case, the powers that be, in both Associations, should attempt to delimit the activities of each, in order to prevent duplication of work. The Institute should cease devoting any time to commercial matters, while the Association should take care that, in discussing the sale of residuals (and it is doubtful whether any phase of residuals is within its scope), it does not trench on the Institute's technical field, covering the preparation of residuals for the market. Also the meetings of the two societies should be held in the same city the same week. The present cost of separate meetings involves unnecessary waste of time and energy on the part of those gas men whose positions make it necessary for them to attend the meetings of both organizations. It is rather strange that the syndicates, who, by paying the dues and meeting expenses of their employees, largely make possible the existence of the societies, do not take active steps towards joint meetings.

To conclude, it begins to look now as if we in America would have two National Gas Associations, just as was the case in England during the days of the Gas Institute and the Institution, without, however, let us hope, the duplication involved in your case. The writer for his own part hopes that later on your example of amalgamation will be followed by the separate organizations this side.

The Professorship of Coal Gas and Fuel Industries at Leeds.—The Council of the Institution of Gas Engineers have issued a circular announcing that arrangements are now completed for the establishment of the Professorship of Coal Gas and Fuel Industries at the University of Leeds, as a memorial to the late Sir George Livesey; upwards of £10,500 having been subscribed to the fund initiated for the purpose by the Institution. The Council point out that, in connection with the work to be carried out by the Professor, an Advisory Committee has been formed; and the names of the members are given.

THE NEW HOBOKEN GAS-WORKS AT ANTWERP.



Photographs by P. DE GEYTER.

General View of the New Works from the River Scheldt.

CONTINENTAL countries have been well to the fore of late years in the building of new gas-works of considerable magnitude and of more than passing interest in their engineering features. Prominent among them are what will henceforth be known as the Hoboken works, at Antwerp, of the Imperial Continental Gas Association. These have recently been brought into action; and therefore we take the opportunity (afforded in courteous compliance with a request) to present readers with a description of them, together with the reproductions of some excellent photographs.

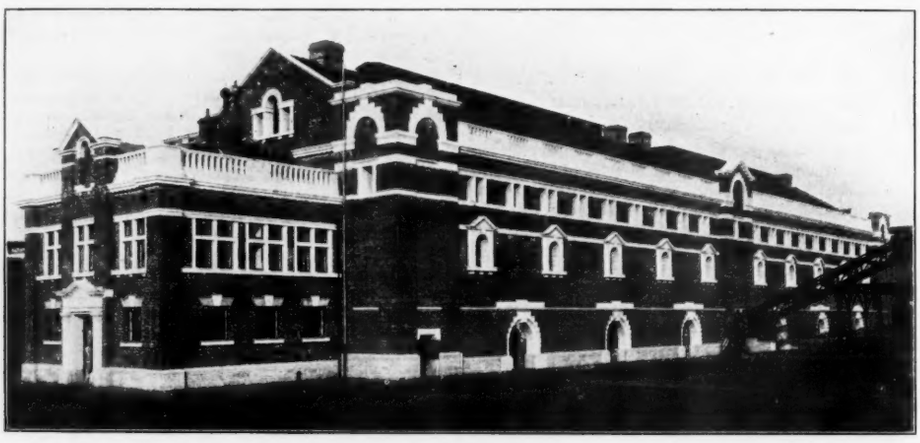
THE SITE AND INITIAL WORK.

The new works are situated on the banks of the River Scheldt, about 5 miles above Antwerp, on a site originally occupied by a shipbuilding and engineering firm, known as "La Vulcain Belge." The site—of some 55 acres—was acquired, together with the buildings, cranes, and electric-generating station, all in comparatively new condition. This fact accounts for the appearance of various buildings which have been adapted to the requirements of a gas-works, but which obviously were not erected for that purpose. The fact that there existed a large electricity generating station in full working order had considerable influence on the arrangement of the works, as it was felt to be unnecessary to provide steam plant; and therefore alternative gas-engine and electrical driving of the machinery has been adopted throughout.

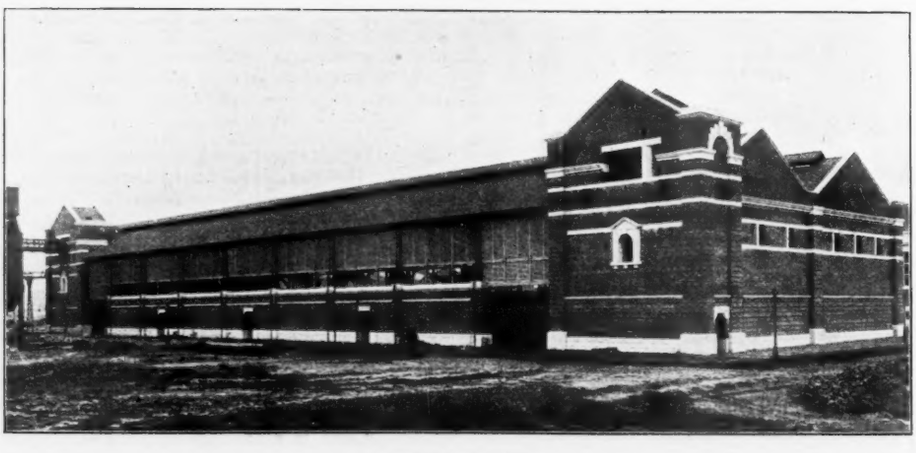
One of the first works undertaken was the reclamation of the foreshore, and the construction of a pier in the tideway, at which steamers of at least 2000 tons might lie at low water. This was a work of great difficulty; and an immense amount of piling and filling-in had to be done. For the filling-in, the material excavated from the gasholder tanks, reservoirs, foundations, &c., was available; and the whole of the river front has now been made-up to the mean gas-works level. The water front consists of timber camp-sheathing, with a long projecting jetty for loading barges along part of its length.

ARRANGEMENTS FOR THE TRANSPORT OF MATERIAL.

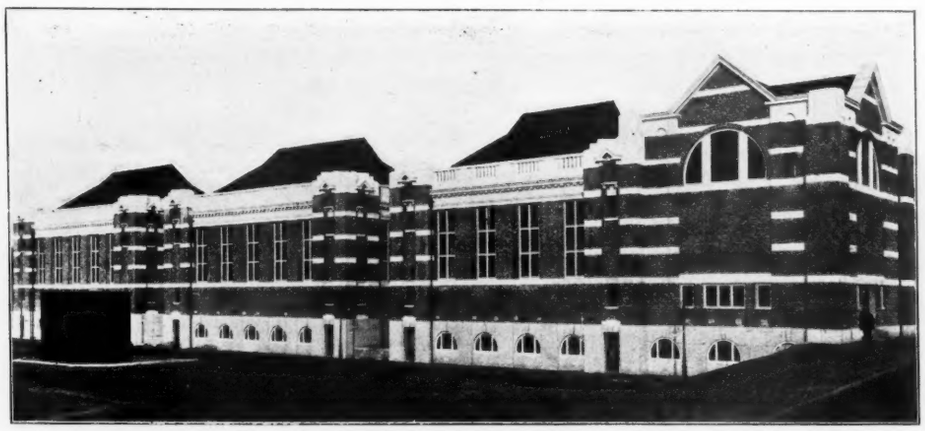
Interest is claimed right away from the start. For the transport of coal from the steamer to the store an aerial ropeway system was decided upon; and this work has been carried out by Messrs. Adolf Bleichert and Co., of Leipzig. Two transporter cranes have been erected on the pier. These take the coal from the steamer by means of grabs holding about 30 cwt., and deposit it in a hopper at the rear of each crane. The ropeway runs from the pier; and the suspended buckets pass round a loop under the hoppers to be loaded. The buckets are weighed, and counted automatically, after which they are pushed on to the main line by hand, and are automatically gripped to the hauling rope, from which they are not released till they return to the loading-station after making a circuit of the coal-store, and being tipped on the way. The cranes and ropeway can discharge coal at the rate of 100 tons per hour. The coal-store (which is placed parallel with the river at the far end of the retort-house) is traversed by the ropeway four times, so that the coal can be well distributed over the area. Without trimming, the store holds about 8000 tons; and the buckets can be tipped at any point.



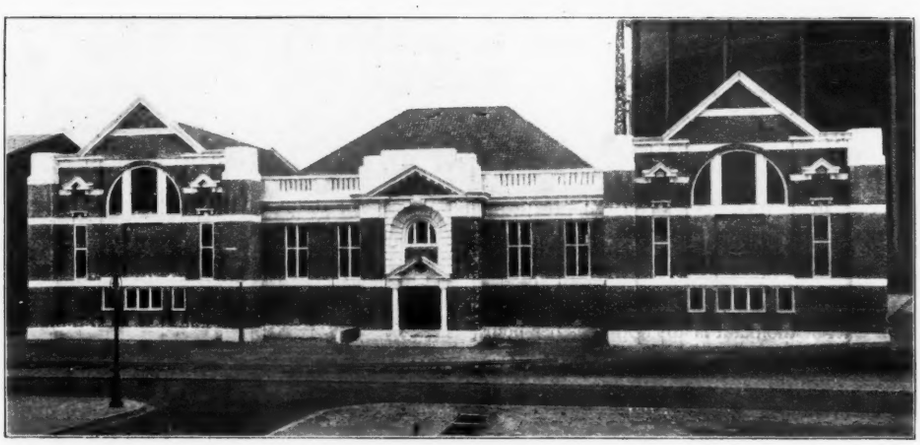
Retort-House and Men's Mess-Rooms.



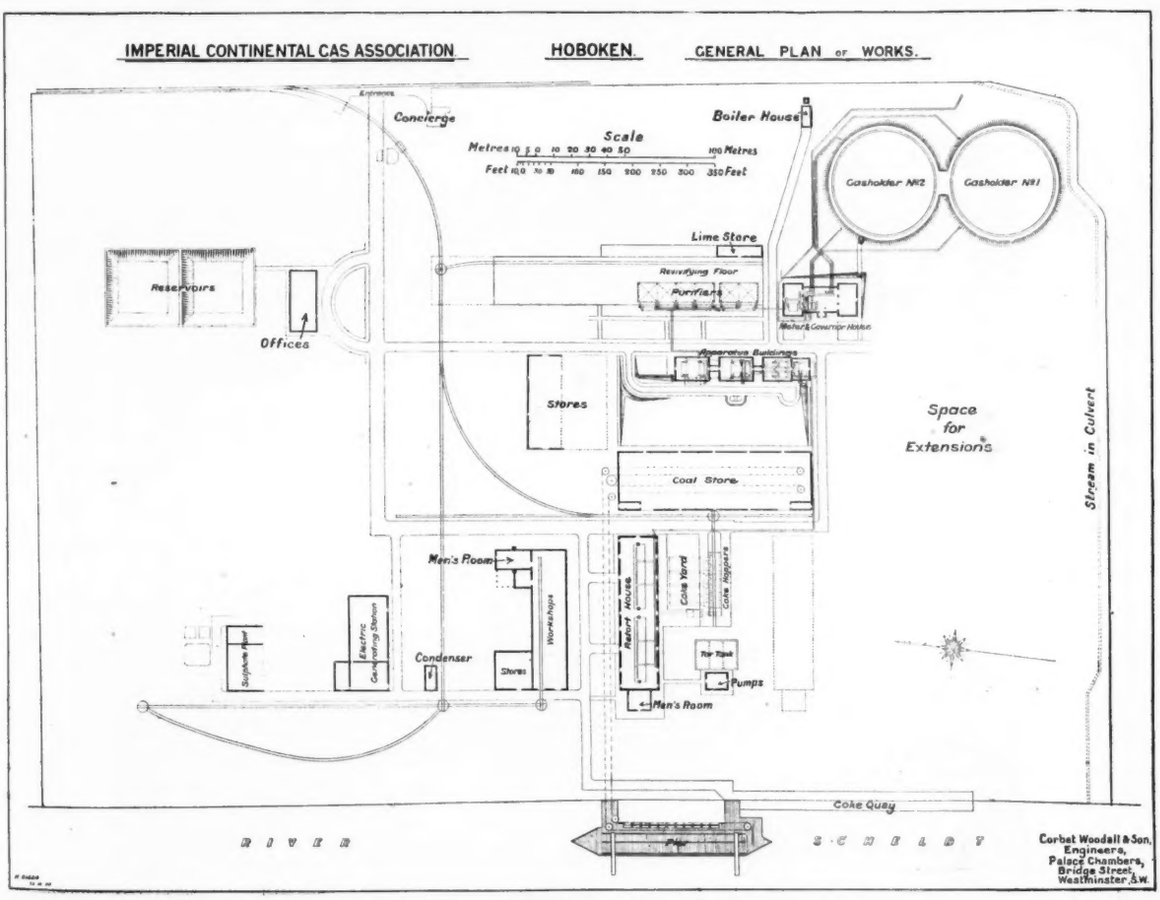
Spacious Coal-Stores.



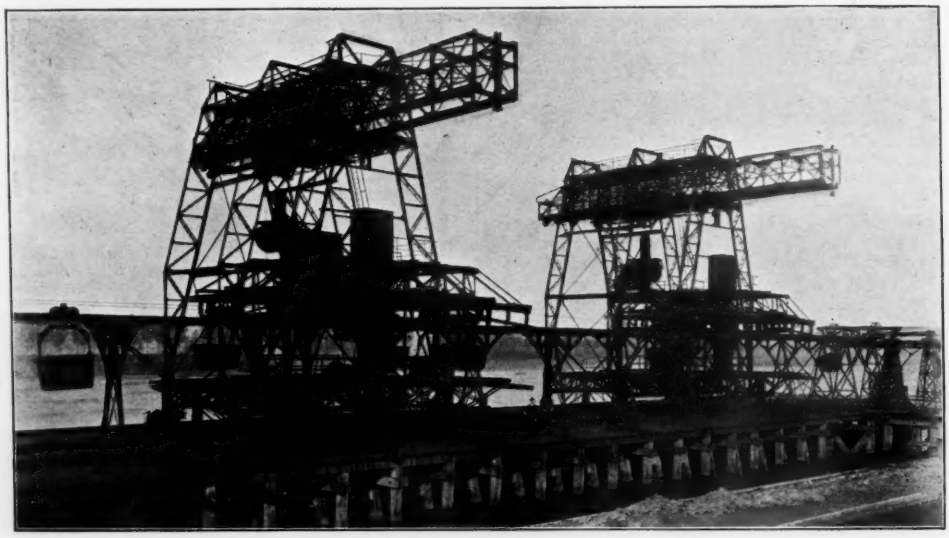
The Apparatus Buildings.



Meter and Governor Houses.



General Plan of the Hoboken Antwerp) Gas-Works.



Electrical Coaling Cranes and Runway.

The retort-house is placed between the coal-store and the river —an arrangement adopted with a view to the disposal of coke, the bulk of which will be conveyed away by water. A railway siding is brought in between the retort-house and the coal-store; and this will be available both for bringing coal in and for taking coke away by rail.

The coal is taken from the coal-store to the retort-house by the usual series of coal breaker and elevator, and push-plate conveyors. The only feature to be noted specially is a band conveyor, running in a subway lengthways under the coal-store. The band can be loaded through hinged doors in the floor-plates covering the subway; and it delivers the coal to the hopper over the coal-breaker. The capacity of this part of the plant is about 40 tons per hour. The subway and breaker-pit are lined with glazed tiles, and both are lighted by electricity.

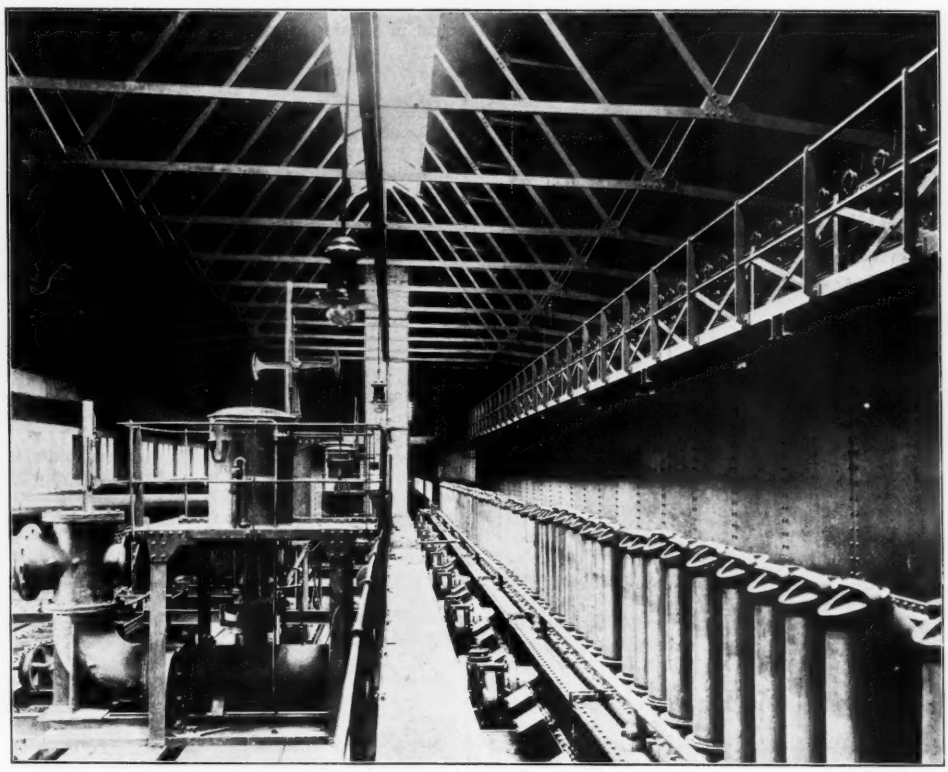
In the Retort-House.

The retort-house and coal-store are both of bold design, and have a substantial appearance. In the former are two benches, each containing nine arches of nine horizontal through retorts, 23 in. by 16 in. by 20 feet long, of ⏢ shape; and the charging and discharging are effected by a Fiddes-Aldridge machine. As far as possible, everything has been arranged for efficiency and convenience, and the comfort of the men. There are two retort governors to each bench; and stages are provided for giving access to them, to the valves and dip-pipes on the hydraulic mains, to the tops of the ascension-pipes, and to the coal-conveyors. The gas is taken off from one end only of the retorts through 8-inch diameter steel ascension-pipes. The retort-benches and coal breaking, elevating, and conveying machinery were all supplied by Messrs. Gibbons Bros.

The Coke-Handling Plant.

The coke is discharged on to De Brouwer conveyors, running in a trough in the floor of the house, and is delivered on to an inclined tray conveyor, by which it is taken either up to the "night hopper," or to the main storage hopper, where it is broken and sorted. The night hopper is intended to hold all the coke produced during a twelve-hour shift; so that, during that time, it is not necessary to work the coke-breaker and Zimmer conveyor screen. The coke stored in the night hopper will nearly all be sent away unbroken. The outlet doors of the hopper are therefore arranged to deliver the coke on to screens for removing the breeze; and these, in turn, deliver the coke into side-tipping waggons, by which it is taken away to be stored or loaded into barges as the case may be. At the main hoppers, the coke is first broken, and then sorted by means of Zimmer screen conveyors into five different sizes. Three of the hoppers have a capacity of 100 tons each; two of them, 60 tons; and there is another of similar size for the breeze. The coke from the hoppers can be discharged either into railway waggons, side-tipping cars, carts, or bags. When the hoppers are nearly full, the coke then being

Retort-Charging Stage, with Fiddes-Aldridge Machine.



The Equipment at the Top of the Retort-Bench.

produced can be discharged into waggons running on elevated lines over the coke yard, so that there also the different sizes of coke can be kept separate. The hoppers were constructed by Les Grandes Chaudronneries de l'Escaut; and the elevator and conveyors by Messrs. W. J. Jenkins and Co.

Tar and Liquor Arrangements.

Near the coke-hoppers is the pump-house, and an underground tar and liquor tank. The pump-house contains three pairs of double-acting vertical pumps (by Tangyes) for tar, liquor, and water. The tar and liquor pumps can work as duplicates one to the other. All the pumps are driven alternatively by electric-motor or gas-engine, by means of belts from a line of shafting. Over the pump-house is a cast-iron tank for tar, liquor, and water. The underground tank has a capacity of 320,000 gallons

Condensing, Exhausting, Tar-Extracting, and Washing Plant.

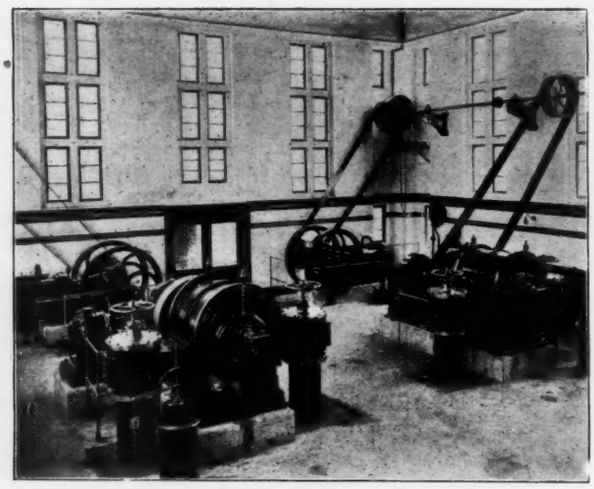
Following the course of the gas, we come to the range of apparatus buildings, which are a distinctive feature of the works, and which extend along one side of the central avenue. There are three separate buildings connected with each other by covered ways. The first contains the condensers and exhausters; the next, the tar extractors and naphthalene washers; and the third, the ammonia washers. Advantage has been taken of the natural slope of the ground to form cellars of ample depth under each building for the mains and valves. Under one of the covered ways, a heating chamber has been constructed for the hot-water apparatus used in warming this block of buildings; there being no steam-pipes for exhauster or washer engines to do this duty more or less effectively.

The apparatus in these buildings is arranged for dealing with the gas from two retort-houses; and, generally, the various parts are disposed in two parallel lines from end to end. Most of the apparatus for the two sections has been installed; and for the present it will be available as reserve plant for the one section now at work.

The condensers are of the water-cooled Reutter type, and were made by Messrs. Clapham Bros. Three of the four columns have been erected; and each condenser has a capacity of 1½ million cubic feet per diem.

The exhausting plant has been supplied by the Bryan Donkin Company, Limited. There are at present in position two exhausters of 125,000 cubic feet per hour capacity, driven by 25-horse power shunt-wound motors by means of worm-gearing. In case of any serious interruption of the electric current, two gas-engines have been provided which would drive the exhausting plant by means of belts. Enough space has been left for two further exhausters of the same size. For regulating the speed, the usual type of hydraulic regulator has been employed; but, instead of controlling the throttle-valve of an engine, they make contacts for a pair of solenoids, which, in turn, move an arm over a series of contacts of a resistance in the armature circuit, so varying the speed of the motor.

Coke-Conveyor, with Night Hopper (Small) and Storage Hoppers for Sorted Coke.



Exhausters, Electrically Driven, with Gas-Engine Stand-by.

In the next house two Pelouze tar extractors, and two naphthalene rotary washers have been supplied by the Berlin Anhaltische Maschinenbau Actien-Gesellschaft. The foundation for a third extractor has been put in; and the connections are arranged so that this third one can be worked in place of either of the two now installed, while they are shut off for cleaning. The naphthalene washers are driven by an electric motor to each machine. As the speed reduction for these is so great, it has been effected in two stages—first by machine-cut, double-helical spur-wheels, and then by worm and worm-wheel to the shaft of the washer. All the gearing is totally enclosed, and makes a very neat and compact arrangement. Space has been left in this house for cyanogen washers; but at present this bye product is not being recovered. In the ammonia house, two rotary washer-scrubbers have also been supplied by the Berlin Anhaltische Maschinenbau Actien-Gesellschaft, and accommodation left for a third washer.

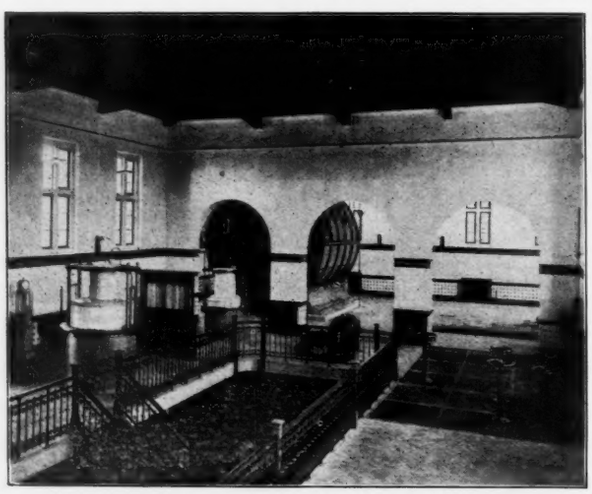
The buildings containing this plant are very commodious and light, and are finished in a style that is not only attractive, but is economical in its upkeep and cleaning. The walls are lined with white-glazed tiles up to the line of the windows, terminating with a coloured frieze. Above the tiles, the walls are plastered and distempered. The open roofs are of varnished pitch-pine; and the floors are laid with buff tiles. All these houses are lit by means of inverted gas-burners on brackets and pendants.

The Purifier-Boxes.

Opposite the range of buildings just described (on the other side of the road) are the purifiers in one of the sheds already on the site. This shed is provided with two 5-ton electric travelling cranes; and, though not a thing of beauty, it answers its purpose. There are four oxide-boxes and two lime-boxes, all 34 ft. 6 in. square by 6 ft. 6 in. deep, with four luteless covers to each. The boxes are filled with "Standard" grids, and are worked by Milbourne valves. The covers are fitted with Milbourne fastenings, and Clapham rubber joints. All of this work was supplied by Messrs. C. & W. Walker. The travelling cranes are used both for lifting the covers, and for filling and emptying the boxes by means of skips.

Meter and Governor Houses.

Immediately after the purifiers, we come to the meter and governor houses. There are two meter-houses with a governor-room between them. The houses are connected right through by arched openings; and in the governor-room are grouped all the connections and valves (as seen in one of the photographs) for the control of the holders as well as the pressure-raising and "boosting" arrangements.



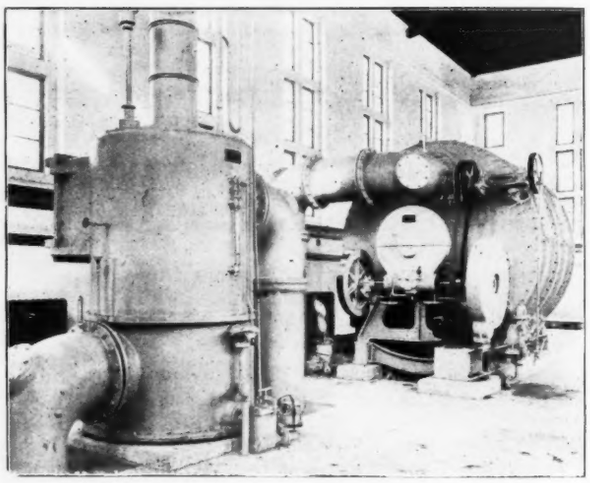
Meter and Governor House, showing Well in Floor for Connections.

Each meter-house is designed for two meters of 125,000 cubic feet per hour capacity. One only has been erected at present; and it was supplied from the Imperial Continental Gas Association's own works at Berlin. The meter is in a circular case, as is the usual Continental practice.

The works are connected with the distribution system of Antwerp by means of a 36-inch main; and the pressure therein is controlled by a 30-inch Cowan governor of the deep-seal type. A 24-inch Cowan governor is also installed as a bye-pass, in case of the holder outlet-valves being accidentally shut. The connections to the governors are so arranged that, in time to come, pressure-raising fans can be put in either for supplying the gas at increased pressure, or for sending it direct by means of an independent main to the distributing holders at the older works in Antwerp. Only a small Sturtevant fan is installed at present; and this will ultimately be utilized for transferring gas from holder to holder as required.

The complicated connections which such a system involves are all exposed to view, and made accessible by means of a large open well in the centre of the governor-room—an arrangement which prevents an accumulation of gas such as might occur in an enclosed cellar. The well is surrounded with a handsome balustrade; and there is a staircase giving direct and easy access to the basement floor.

The interior of these houses is similar to that of the apparatus buildings; but the glazed tiling is somewhat more ornamental. On account of the Government regulations which prohibit naked lights in a building of this character, it was deemed advisable to light it with electric light.



Tar Extractor and Naphthalene Washer.

The Gasholders.

Two gasholders have been constructed by Messrs. Clayton, Son, and Co., Limited. Each holder has three lifts, and a capacity of 2½ million cubic feet. They are in brick tanks, and have lattice guide-framing. No particular difficulty was met with in the construction of the tanks, as firm clay was found at the foundation level.

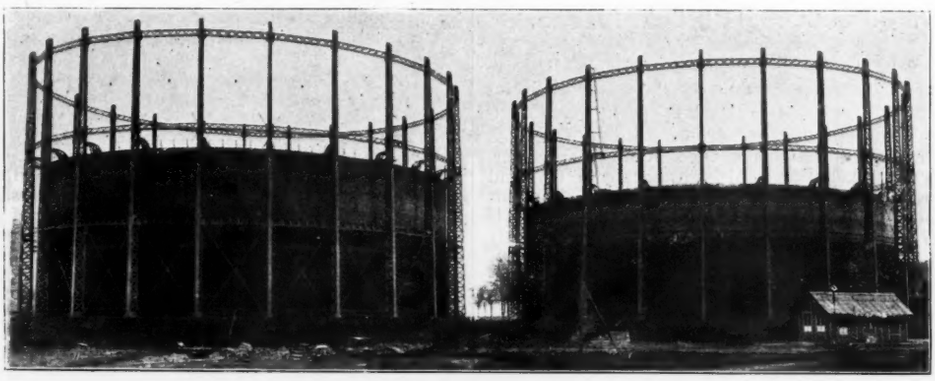
Varied Foundations and their Treatment.

Speaking of foundations, it is interesting to note that nearer the river, and in fact for the foundations of all the main buildings, occasional bad and treacherous ground was met with, due partly to an ancient watercourse, and partly to clay excavations at some remote period which had been filled-in with soft material. The top surface of fairly firm ground was not stable enough to support heavy buildings such as the retort-house and coal-store. As soon as this was penetrated, a thick bed was found formed of a mixture of mud, sand, and clay, thoroughly waterlogged, and so soft that it was frequently easier to excavate with a bucket than with a shovel.

After having much difficulty with the foundations of the retort-house and coal-store, a system of concrete cylinders was adopted for the remaining buildings. In many cases, these cylinders had to be sunk to a depth of more than 20 feet before firm clay was reached. The gasholder tanks and other buildings, together with the pier and wharfing, were all carried out by a well-known local contractor, M. G. Van Bergen, of Antwerp.

Workshops, Stores, &c.

Returning to the old buildings which have been retained near the river, the one next the retort-house has been adapted for workshops and stores. One end has been bricked-off to provide lavatory accommodation and mess-rooms for the yard men and mechanics. Here, again, white glazed tiles have been extensively



Gasholders, each of 2½ Million Cubic Feet Capacity.

used. Numerous wash-basins and showers, with both hot and co'd water, have been fitted.

ELECTRICITY GENERATING PLANT.

Next to this building is the electric generating station, in which are two sets of triple-expansion marine type engines of 550-horse power each, driving compound wound generators. These sets were part of the equipment of the shipbuilding works. A compound high-speed engine by Bellis and Morcom has since been added, driving a 200 kilowatt shunt-wound generator by the Compagnie Internationale d'Electricité of Liège. This latter set will generally be used for supplying electric power to the gas-works, while the larger units will only be employed when the coaling-cranes are in action. Steam is supplied from four Lancashire type boilers, working at 150 lbs. pressure. As in most generating stations, the switchboard is a noticeable feature. There are eight marble panels in the distributing board, and seven for the engines and storage battery. Direct current is supplied at 440 volts. It should be mentioned that the electric generating station is under the direct supervision of Mr. J. W. W. Melhuish, M.I.C.E., of Berlin, who was also consulted as to the electrical work generally.

THE SULPHATE HOUSE.

Next to this plant is the sulphate of ammonia house, for which, again, an old building has been adapted. Two sets of apparatus have been supplied by Messrs. C. & W. Walker; each set being capable of dealing with 50 tons of liquor per diem.

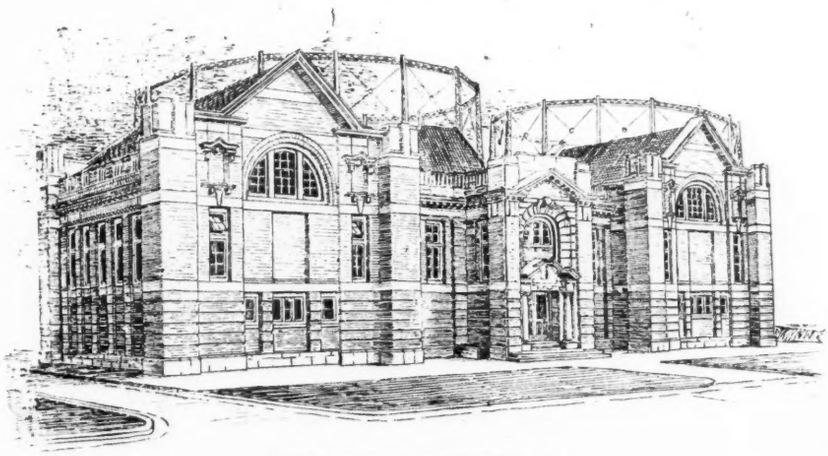
WATER RESERVOIRS, OFFICES, AND LIGHTING.

On the higher ground away from the river, two open reservoirs have been constructed to conserve the water from a stream which flows abundantly in the winter, but which in summer is often nearly dry. The reservoirs have a capacity of 1½ million gallons; and the works are largely dependent on them for the supply of water.

Between the reservoirs and the entrance road, an extensive wooden building has been adapted for offices; a commodious range of rooms being reconstructed on the ground floor.

The roads and general lighting of the works is by means of inverted Graetzin gas-lamps. The pressure employed is about 3 inches; and a good effect is produced.

The new works (which we have shown are of considerable extent, and contain many interesting features) have, in their entirety, been carried out to the design of Messrs. Corbet Woodall and Son, of Palace Chambers, Westminster, S.W. Mr. W. J. Brender à Brandis, the Association's Chief Engineer in Antwerp, shared with Messrs. Woodall and Son the responsibility for the works during construction; the more immediate supervision being undertaken by Mr. E. Ditte, who acted as Resident Engineer.



Hoboken Governor and Meter House.

Sketch by J. FISHER.

The Late Mr. Greville Williams.

The current number of "Nature" contains an appreciation of the late Mr. Greville Williams, F.R.S. (whose death was recorded in the "JOURNAL" for the 21st ult.), by a friend of nearly sixty years' standing. He states that Mr. Greville Williams commenced his professional career as First Assistant to Professor Anderson, of the Glasgow University. After some years spent in research work, he moved to Edinburgh, where he conducted a tutorial class under Dr. Lyon Playfair. From 1857 to 1859, he was Lecturer on Chemistry in the Normal College, Swansea. In 1859, he returned to Glasgow as Chemist in the works of Messrs. Miller, chemical manufacturers. He migrated to Greenford Green in 1863; remaining with Messrs. Perkin until 1868. About this year he entered into partnership with M. Edouard Thomas, at the Star Chemical Works, Brentford; the firm being makers of coal-tar colours, and subsisting until 1877. Mr. Greville Williams then gave up his connection with manufacturing chemistry, and entered the service of the Gaslight and Coke Company, with whom he remained until 1901, when he retired into the country, and seldom saw any of his old friends and acquaintances. Though in reality a charming companion, with unusual conversational powers, and a keen appreciation of literary and artistic culture, he possessed a very modest and retiring disposition, and became, especially of late years, an almost complete recluse. This debarred him from the continuance of his scientific researches; but during his life he made many interesting discoveries, and has left a considerable record of thoroughly sound work. He contributed a number of papers to the Transactions of the Royal and Chemical Societies, in addition to his articles in the "JOURNAL" and other publications, and in Ure's and Watts's Dictionaries. His chief literary work was "A Handbook of Chemical Manipulation," published in 1857, a supplement to it being brought out in 1879.

THE LIST OF SUCCESSFUL CANDIDATES.

"Gas Engineering" and "Gas Supply" Examinations.

By perseverance and the kind assistance of the several Secretaries of the centres at which the examinations in "Gas Engineering" and "Gas Supply" were held, we have been enabled to get together a fairly complete list of the successful candidates. The acknowledgment should be made that though the City and Guilds of London Institute compelled us to take the circuitous and laborious course that has had to be followed to obtain this list (while they themselves could, as they have courteously hitherto done, have provided a much shorter way, and a way not liable to the same mishaps or deficiencies as is the one compulsorily pursued), Sir Philip Magnus himself kindly supplied the list of the names and addresses of the Secretaries of the centres, and furnished the names of the successful candidates who went direct through the department at Kensington. For such consideration we thank him. Accompanying this are also the names of the Secretaries of the various centres who (though some required stimulating by a second application) have kindly co-operated with us in compiling the list of successes. The only ones who have not deigned to reply to our communications are the Secretaries at Weymouth and Alloa; and we presume the reason for their silence is that there were no candidates on this occasion in those quarters. Nor could we get from the department of the London County Council concerned in this matter (we regret this, and think it a great pity) a list of the successful candidates who entered the examinations under their auspices. The disencouraging and anything but helpful view of the department seems to be that, if it is worth while to publish the names of the successful candidates, they should be supplied by the City and Guilds of London Institute. We agree that the Institute is the proper source of information; but unfortunately the Institute authorities hold other opinions. However, the views of the Institute and of the department of the London County Council do not coincide with those of the gas industry and particularly with those of the candidates themselves. Even now we will gladly supplement the present list with any missing names that the London County Council can supply, if they will do so. We have done our best, and cannot do more; but the absurdity of having to adopt such elaborate means to compile a list of successful candidates is the irritating feature.

In the following lists the number after the names refers to the centres at which the candidates were examined. See opposite page.

GAS ENGINEERING.

Honours Grade.

First Class.

Aitken, Harry A. 334
Ashmole, Gordon. 170
Atley, W. Walker. 286
Ault, Walter S. 257
Barclay, Warren. 170
Batt, Frank. 303
Berry, Arthur G. V. 60
Billingsley, Harold H. 257
Blair, William. 337
Brewer, P. 384
Broadberry, Leonard. 170
Bullen, Arthur E. 36
Carmichael, Thomas. 337
Coombs, Harold A. 75
Cross, Douglas C. 170
Eastwood, Albert I. 123
Elcock, Frank. 257
Green, John. 295
Hartley, Dennis. 289
Hawkyard, W. 124
Hodder, Harry J. 210
Holland, Edward L. 257
Holt, J. E. 124
Jones, Harold. 257
Mackie, Alexander. 330
Mann, Harold C. 170
Marsh, Richard G. 257
Morley, Harry P. 257
Myers, Ernest. 297
Nice, Alma J. L. 60
Pond, H. G. 384
Ranft, John H. 257
Ritchie, Douglas. 210
Rudge, Charles A. 286
Ruthven, Robert H. 444
Scaife, Frank L. 200
Smallman, Spencer. 257
Taylor, George. 123
Webb, Francis S. 170
Whiting, William H. 257
Williams, Samuel J. D. 257
Willsmer, Norrie. 170
Winslow, George. 170

Honours Grade.

Second Class.

Bamforth, Arthur S. 290
Bartlett, Oliver J. 57
Belton, C. M. D. 124
Bolton, Wilfred. 292
Brown, John W. 28
Bryan, William S. 60
Burton, William T. 444
Clarkson, Harry. 286
Fletcher, William. 123
Frisch, Geoffrey. 250
Haynes, George H. 123
Holdroyd, Guy. 272
Jenkins, Edward K. 60
Jones, Isaac J. 60
Kendall, George S. 257
Kimber, O. 384
Mansell, Harry L. 123
May, Harry V. 191
Messenger, Ernest. 290
Messenger, Samuel. 257
Millen, Ralph. 286
Norris, William. 123
Robinson, Albert E. 257
Robinson, Frank C. 257
Sawyer, George. 57
Shepherd, E. C. 384
Simmons, Alexander. 337
Skinner, Frederick. 123
Smith, Morris L. 58
Tayleur, Guy. 78
Waterfield, Edwin W. 170
Watson, Walter J. 123
Wellard, Leonard. 170
White, Osman. 288
Whitehead, Sidney E. 257
Wilkinson, Geoffrey. 113
Wright, Alexander. 337
Wyver, Clifford. 215

Ordinary Grade.

First Class.

Allbutt, Victor O. 257
Allen, Henry J. 70
Ames, Arthur F. 124
Arnold, Stanley H. 428
Baker, Harry. 225
Bearne, Paul O. 37
Beynon, Frederick H. 37
Binks, Joseph. 286
Birks, Douglas. 288
Brown, William. 170
Carpenter, George E. 170
Collings, William P. 37
Cook, Thomas R. 123
Craggs, Thomas A. 200
Croxford, Leslie J. 170
Dean, H. W. 124
Dickinson, Harold. 112
Dixon, J. W. 124
Donaldson, John H. 170
Dreaper, William H. 200
Duxbury, R. H. 124
England, Albert A. 170
English, Edgar. 152
Fisher, Jesse. 257
Floyd, C. S. 124
Gorwyn, Cecil L. 37
Grainger, James E. 60
Harding, G. 124
Herrick, H. D. 257
Hill, E. 124
Hilson, John G. 170
Hodgson, H. W. 123
Hole, George. 170
Holliday, James E. 292
Howard, Charles. 83
Howell, Albert. 123
Jeffrey, J. S. 124
Jeffreys, J. S. 170
Jones, Evan J. 70
Kennedy, F. J. 124
Keywood, William T. 250
Lacy, John. 78
Luxon, Reginald G. 31
M'Donald, Arthur T. 337
Newbery, H. A. 257
Newman, H. S. 124
Ostler, Peter. 334
Page, James L. 170
Parsons, B. F. 257
Partridge, Henry. 170
Pickford, G. W. 124
Poulson, T. H. 257
Priest, Francis R. 170
Rogerson, William. 124
Russell, Robert. 334
Savage, William J. 257
Shearer, Robert W. 337
Smith, J. H. 288
Stapleton, Frank W. 60
Triggs, John S. 123
Ward, Cyril G. 257
Weston, Ronald A. 191
Williams, George B. 444
Winslow, Alfred D. 170
Withers, George E. 60
Woolnough, Ernest. 58

Ordinary Grade.

Second Class.

Alford, Arthur N. 170
Bostock, Clifford. 124
Brown, John W. 200
Buckland, Charles. 60
Buckwell, David. 57
Buxton, Arthur T. 28
Caudwell, Frank. 170
Clark, William H. 170
Conn, Thomas. 371
Cox, Frank E. 257
Craig, John W. 337
Elsby, Ralph W. 210
Graty, J. L. 124
Green, Frederick. 124
Griffiths, Herbert. 124
Hearn, John. 334
Henn, Karl. 257
Hidderley, F. 124
Hodgson, John W. 372
Holcombe, W. E. 206
Holloway, Howard E. 78
Howard, William C. 170
Hughes, Tom. 206
Johnson, Stanley B. 291
Kearney, John. 123
King, Walter G. 176
Knowles, Alexander. 381
Larkin, Leslie. 170
Marshall, William J. 123
M'Donald, C. J. 124
Mitchell, Norman S. 372
Noden, Tom J. 215
Ordish, John W. 257
Parsons, Edward. 170
Peel, Fred. 288
Philpot, Herbert. 432
Prentis, Arthur E. 170
Price, Robert. 257
Proctor, William C. A. 176
Pykett, Frederick. 272
Richardson, Percy. 272
Rosser, Bert. 70
Ruggles, C. G. 2
Samuels, Edward. 37
Searle, John A. 78
Simmonds, Vernon. 176
Snook, Walter. 170
Taylor, Albert Cecil. 120
Whitney, Alfred C. 257
Wilkinson, Charles J. 291
Wright, Stuart P. 257
Wyman, Reginald L. 5

GAS SUPPLY.

Honours Grade.

First Class.

Ablett, Ernest. 292
Ault, Walter S. 257
Briggs, F. C. 372
Cardwell, Frank. 170
Cross, Douglas C. 170
Eastwood, Albert I. 123
Elliott, George H. 291
Holdsworth, Charles E. 291
Jones, George B.
Lang, J. 288
Luxon, Reginald G. 31
Marsh, Richard G. 257
Nuttall, Lawrence W. 81
Pepper, G. J.
Ranft, John H. 257
Roper, J. W. 288
Rosevear, Charles E. 170
Simmons, Alexander. 337
Townsend, Charles V. 292
Townsend, jun., Harry. 292
Twist, George. 297
Winslow, George. 170

Honours Grade.

Second Class.

Batty, T. E. 297
Berry, E. J.
Birks, Douglas. 288
Bridge, J. 124
Broadbent, A.
Bullen, Arthur E. 36
Chandler, Samuel B. 444
Chapman, Lambert. 34
Clarkson, Harry. 292
Cotton, John. 291
Dees, William J. 444
Elcock, Frank. 257

Franks, John W. 257
Frisch, Geoffrey. 250
Harding, Herbert J. 123
Harrison, Thomas W. 190
Helden, Robert. 444
Highmore, Joseph G. 444
Hill, Alfred. 257
Hodder, Harry J. 210
Hughes, George H. G. 27
Jackson, William. 81
Kennington, John. 291
Lea, H. W. 124
Lloyd, Alfred E. 27
Mansell, Harry L. 123
Noon, E. H.
Pawson, Geoffrey. 34
Roberts, Victor C. W. 413
Robson, David E. 34
Simmons, Samuel W. 123
Skinner, Frederick. 123
Smallman, Spencer. 257
Wheeler, Percival. 166
Whitehorne, Arthur G. 251
Williams, Samuel J. D. 257

ORDINARY GRADE.

First Class.

Allbut, Victor O. 257
Ardron, F. C. 290
Balmforth, J. 410
Berry, Arthur G. V. 60
Bridgland, Alfred H. 166
Chamberlain, John B. 190
Chant, Arthur G. 166
Conn, Thomas. 371
Cook, Thomas R. 123
Corfield, Horace V. 166
Crowther, George. 123
Dreaper, William H. 200
Duxbury, R. H. 124
Dyson, Thomas. 290
Farr, W.
Forbes, Edward. 337
Gedge, Harold C. 159
Godden, Theophilus. 123
Gorwyn, Cecil L. 37
Green, Frederick. 124
Harris, William E. 444
Heffernan, John. 444
Hill, E. 124
Jeffreys, J. S. 170
Jones, Evan J. 70
Kay, Archibald. 337
Kennedy, F. J. 124
Kent, Archibald. 191
King, Edgar. 81
Lockey, Alfred E. 200
M'Lean, Benjamin F. 23
Mercer, Thomas. 166
Morley, Harry P. 257
Munro, James R. 27
Ostler, Peter. 334
Parsons, Edward. 444
Poulson, Thomas H. 257
Pykett, Frederick. 272
Reed, William B. 444
Robertson, R., 206
Rodgers, George H. 444
Rogers, Robert E. 123
Schofield, T. 290
Shackleton, Edward. 190
Shearer, Robert W. 337
Sinclair, Robert E.
Southworth, John. 123
Taylor, G. L. 288
Tilson, Hedley V. 190
Turner, A. G.
Vaughan, Albert W. 444
Walters, Bert H. 444
Webb, Francis S. 170
Whiting, William H. 257
Willison, Harold. 166

ORDINARY GRADE.

Second Class.

Aitken, Moses N.
Alford, Richard T. 444
Ames, Arthur F. 124
Bartlett, H. J. 186
Bevis, James. 444
Blake, Alfred J. 152
Bradford, Alfred H. 444
Bullwinkle, G. R. 186
Campbell, Albert. 123
Chapman, W. A. 182
Clark, F. 206
Clubley, Charles. 291
Cogger, Sydney. 444
Coggin, Lionel H. 444
Cooke, Arthur. 291
Cooper, John A. R. 370
Cox, Frank E. 257
Crowther, Bertram. 123
Cullington, Alfred D. 90
Curtis, George. 3
Dixon, J. W. 124.
Doidge, Percy J. 37
Dolan, William.
Fiddes, H. F. 206
Foster, John W. 37
Graty, J. L. 124
Hamer, Frederick M. 37
Hearn, John. 334
Henn, Karl. 257
Holliday, James E. 292
Holroyd, J. W. 290
Horne, Sidney. 291
James, William H. 37
Jennings, Alfred T. 444
Johnson, Oswald. 27
Johnson, Stanley B. 291
Kerridge, Herbert W. 233
Langford, Harold M. 444
Lloyd, Edward. 27
Loftus, Leonard. 27
Lucas, Arthur A. 272
Luck, James A. 444
M'Donald, C. J. 124
M'Gregor, Robert B. L. 444
Mansfield, C. F. 37
Marshall, William J. 123.
Miller, Alfred. 291
Moulder, James J. 444
Nicholson, William E. 444
Owen, Herbert. 27
Page, Edward I. 206
Peel, Fred. 288
Pierce, Edward J. J. 27
Pocock, James W. 444
Priest, William C. 166
Quelch, Stephen J. 444
Roberts, Albert. 27
Roberts, Arthur B. 444
Rosser, Bert. 70
Sanders, Charles F. 159
Sanderson, William. 272
Savage, William J. 257
Sawbridge, G. T. 297
Seyssert, Alfred M. 444
Smith, Albert S. 206
Smith, James. 272
Steele, William.
Strathearn, James.
Sumner, Horace R. 170
Sutcliffe, Herbert. 444
Thompson, Alfred. 152
Thrift, Arthur J. 159
Vallance, Arthur S. 37
Verity, Albert W. 288
Ward, John J. H. 182
Wheeler, Ernest J. 444
White, James.
Wicks, Herbert W. 152
Wilberforce, Wilfred. 291
Wilmer, H. W. 288
Wilson, R. J. 186
Wilson, Thomas. 337

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Mr. T. E. Cumming, of Ilford, has been appointed to the position of Chief Clerk to the Cheltenham Gas Company, as recently advertised in our pages.

Mr. I. Hooper, who has resigned the position of Water Inspector to the Corporation of Dorchester, recently entertained the employees at supper. In the course of the subsequent proceedings, he was presented with an easy-chair, in token of the respect and esteem in which he was held; and he expressed his thanks in an appreciative response.

We are pleased to learn, from an announcement in the "London Gazette" last Friday, that His Majesty the King has appointed Sir William Crookes to the "Order of Merit." Sir William has on three occasions received the medals of the Royal Society, of which he is the Secretary, and has been President of the British Association and the Chemical Society. In collaboration with Sir James Dewar, he for some years made analyses of the water supplied to London by the late Water Companies; the results being published monthly.

EXAMINATION IN "GAS SUPPLY"—THIRD YEAR.

Answers to the Questions Set.

[Second Article.]

6 (A). In practice, bunsen flames with luminous tips are met with. Give three cases, explaining in each the cause and the remedy to be applied.

(1) An upright incandescent burner flame with an insufficient supply of primary air will become luminous at the tips. The remedy is, therefore, to open the air-ports until the yellow tip disappears.

(2) When the gauze in an upright incandescent burner has become almost choked with particles of dust and fibre, the gas is impeded and its velocity diminished, with consequent reduction of suction on the primary air inlets. Then the flame burning with an insufficient supply of primary air is partly luminous. The remedy is to dismantle the burner and clean the gauze. A similar cause frequently produces a white flame above the bunsens of stand gas-irons.

(3) When an inverted burner has the products of combustion commingling with the primary air supply, the yellow tipped flame is very noticeable. The remedy is to fix a deflector to the burner in order that the products may be directed away from the primary air inlets.

---

6 (B). How is efficiency best secured in the construction and use of (*a*) top burners of gas-cookers, (*b*) gas-irons? State the proportion of primary air to gas in a well-constructed bunsen, and the essentials of a good flame.

(*a*) The mixing-tube should be of sufficient length to ensure thorough mixing of gas and air, smooth inside, and either straight in the bore or formed in two cones on the Venturi principle. The bunsen holes must be of a size and number to give the same length of flame from each hole. If the holes are too large, the flames will be different lengths. The primary-air inlets should be divided round the gas jet or jets to assist the mixing. The nipple must be drilled perfectly true with the axis of the bunsen tube, and tapered from inlet to outlet. It must also be placed concentric with the bunsen tube. The nipple perforation should be round, and have no abrasions on the edges. The bars over the burner should offer as little resistance as possible to the flames, and should be situated about 1¼ inches above the burner, unless the holes are drilled on the top. The burners should be kept clean by taking out, boiling frequently, and drying. As it is not absolutely necessary for the oven or top burners to be noiseless, it is preferable to admit a greater proportion of primary air than in incandescent burners; thus obtaining a shorter and hotter flame—the Venturi tube, mentioned above, being excellently devised to this end. It is also important that the flame, particularly the inner cone, should not come into contact with any cold surface. A cooling of the inner cone will produce carbon monoxide and an offensive odour. This should be tested by placing a kettle of water over the burners when the tap is full on.

(*b*) With a gas-iron the points enumerated above with regard to cleanliness of the burner also apply. A gas-iron is used almost continually under the nose of the user, and any offensive odours not only indicate incomplete combustion, but result in a mistaken condemnation of gas-irons. The bunsen flame should be at such an angle that the underside of the flame only just touches the metal bottom of the iron. The flame should not roar (denoting excess of primary air), or the to and fro motion of the ironing may cause back-firing. The handle should be protected by a metal shield brightly polished on the underside to reflect the heat, and thus keep the hand as cool as possible; and it should be composed of non-conducting material (usually hard wood). The flue outlet should be large enough to effectually carry off the whole of the products and prevent partial smothering of the flame inside. The secondary-air port should be sufficiently large to allow a slight excess of air to the flame, even at the risk of slightly diminishing the temperature of the combustion chamber. The flue outlet should be carried up a few inches and then bent over at right angles, and turned to the right side of the iron, so that the products are not checked in their outward progress by the to and fro motion, nor emitted into the face of a right-hand user.

The proportion of primary air in a bunsen flame is about 3 volumes of air to 1 of coal gas; the proportion being less when mixed with water gas. In a well-constructed bunsen burner, the gas and air must be adjusted so as to give a violet blue tint in the zones of the flame. The flame should be as solid and steady as possible, with a minimum of noise.

---

7 (A). State concisely the construction of ordinary types of (*a*) flat-flame, (*b*) argand, and (*c*) regenerative gas-burners.

(*a*) Ordinary flat-flame burners usually consist of a brass case with an enamel head; the shape of the enamel depending upon the type of burner. In a fishtail burner, the gas issues from two channels drilled in the enamel at an angle a little greater than 45 degrees, the size of these channels depending upon the quality of gas to be consumed. The two jets of gas impinge against each other, and when lit the flame spreads out in the form of a fishtail. Each burner is fitted internally with a muslin screen, which causes an even flow of gas.

The batswing burner (fig. 7), so named from the shape of the flame obtained, has a hollow dome-shaped enamel top. Across this a narrow slit is cut; the size depending upon the quality of gas to be consumed. This burner requires less pressure than the fishtail type. In other respects, the construction is similar.

(*b*) The "London" argand burner (fig. 8) consists of a chamber annular in form and made of steatite. It is provided with three

Fig. 7.

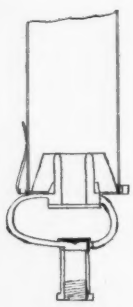


Fig. 8.

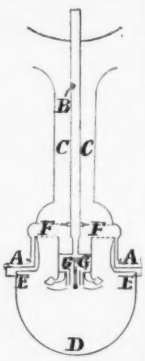


Fig. 9.

tubes, which communicate with the interior of the chamber and the gas supply. The top of the chamber is perforated with small holes, 24 in number, from which the gas issues, forming, when lit, a cylindrical sheet of flame. Supported on a gallery attached to the lower portion of the burner is a glass chimney, which surrounds both chamber and flame. This induces a supply of air on the surface of the flame, and protects it from air currents. A metal cone is placed between the chimney and the burner holes, to further deflect the air supply upon the surface of the flame. The burner is so constructed that the gas issues from the burner holes at less pressure than that at which it enters the burner. This is done by making the combined sectional area of the three supply tubes less than the combined area of the burner holes from which the gas issues. The air supply to an argand burner is usually regulated by the chimney.

(*c*) The principle of a regenerative burner is that the air and gas are heated by the products of combustion before reaching the point where they are burnt. The "Wenham" gas-lamp (fig. 9) is a good type. The air enters the lamp at A and passes through a series of channels F F and G G, around which the products of combustion are made to pass. Also, the gas-feed B passes through the chamber C, up which the products of combustion travel to the outlet. The glass bowl D is sealed perfectly tight at E, so that all air for combustion enters at A.

Regenerative lamps are used extensively as an aid to ventilation; thus making use of the fact that the combustion of gas induces an upward current of air. If the lamp is fixed in the centre of a perforated ceiling, large volumes of air will be drawn from the room into the ventilating shaft.

7 (B). In the maintenance of incandescent burners (inverted and upturned) what are the points to be observed to secure a low mantle account without sacrificing efficiency?

(1). Only good quality mantles should be purchased.

(2). A good type of burner with gas and air adjuster should be adopted.

(3). Periodical inspection of burners should take place.

(4). If burners are subject to any vibration, anti-vibrators should be attached.

(5). Suitable glassware, Jena quality, should be used to protect mantles from draughts.

(6). The flame should be adjusted to suit the quality and pressure of gas before the mantle is put on.

(7). In upturned burners correct size of rod should be used and be firmly fixed.

(8). Bye-passes should be so fixed as not to produce deposit of carbon on mantle.

(9). In outside shop or public lamps, the best type of wind-proof lantern should always be employed, with flashlight or else some auto-lighting arrangement.

---

8. Describe the operation of starting a gas-engine, including the regulation of gas into the cylinder after the engine has been "overbauled." Which form of ignition tube do you consider most satisfactory, and why?

[Do not attempt to start a gas-engine when it is connected to a load, unless it has a powerful starter.]

First light the bunsen, which heats the ignition tube. If electric ignition, disconnect the wire and try sparking. Then oil the engine, thoroughly filling every cup, and open the oil-cups which cannot be reached when engine is running.

The starting cam should then be set to start, or else the relief cock opened, as the case may be. The gas-valve is opened one-third the opening used when running, usually at a point on the gas-valve dial marked "start." The fly-wheel is then turned in the running direction until the engine takes up the cycle—*i.e.*, until an explosion is obtained. Then the operator should immediately take hold of the gas-valve handle and open gradually to the running position as the engine increases in speed. If the valve is opened too quickly, too rich a mixture will be obtained, with failure to produce ignition, and consequent stoppage of the engine. While the gas-valve is being opened, the relief cock should be closed, or the starting levers thrown into the running position. When the engine has reached full speed, the load may be coupled, the remaining oil cups opened, and the water supply started to the water jacket.

To obtain proper regulation of the mixture into cylinder, an indicator diagram should be taken. This will show whether a weak mixture is being obtained or not, in which case the gas-valve should be adjusted accordingly.

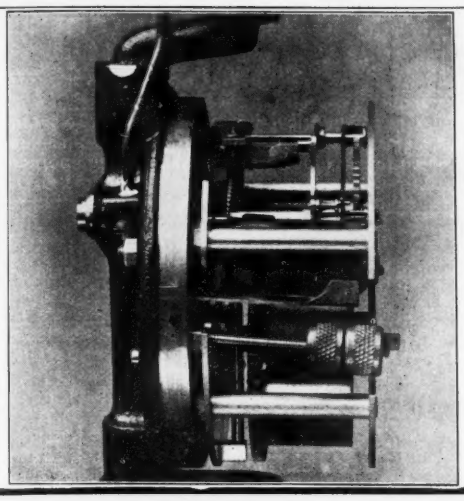
The best form of ignition tube is made of nickel alloy. These will last, with ordinary care, from 6 to 18 months, according to the amount of work the engine has to perform; but they are expensive in the first instance. Porcelain tubes are much cheaper, and with care will last a few weeks.

---

9. Describe the following: (*a*) Anti-pulsator; (*b*) adjustable die stock; (*c*) service-cleanser; (*d*) expansion gas-main joint (with sketch); and (*e*) the operation of making a gas-main joint with lead wool.

(*a*) An anti-pulsator (fig. 10) is a flexible bag fixed between a gas-engine and the meter which supplies same. It consists of a sheet of india-rubber ⅛-inch thick, B, secured to a cast-iron frame A A. To the centre of B is attached a rod C, which is slotted as shown. D is the outlet to the engine, and E the inlet from the meter. The gas enters at E and passes through the slot in C; thus causing the diaphragm to expand, carrying with it the rod C until the enlarged portion F at the end closes the gas-way G. When the engine draws gas at D, the diaphragm collapses, and opens G to the gas supply.

The object of the anti-pulsator is to guard against pulsations of the engine causing fluctua-



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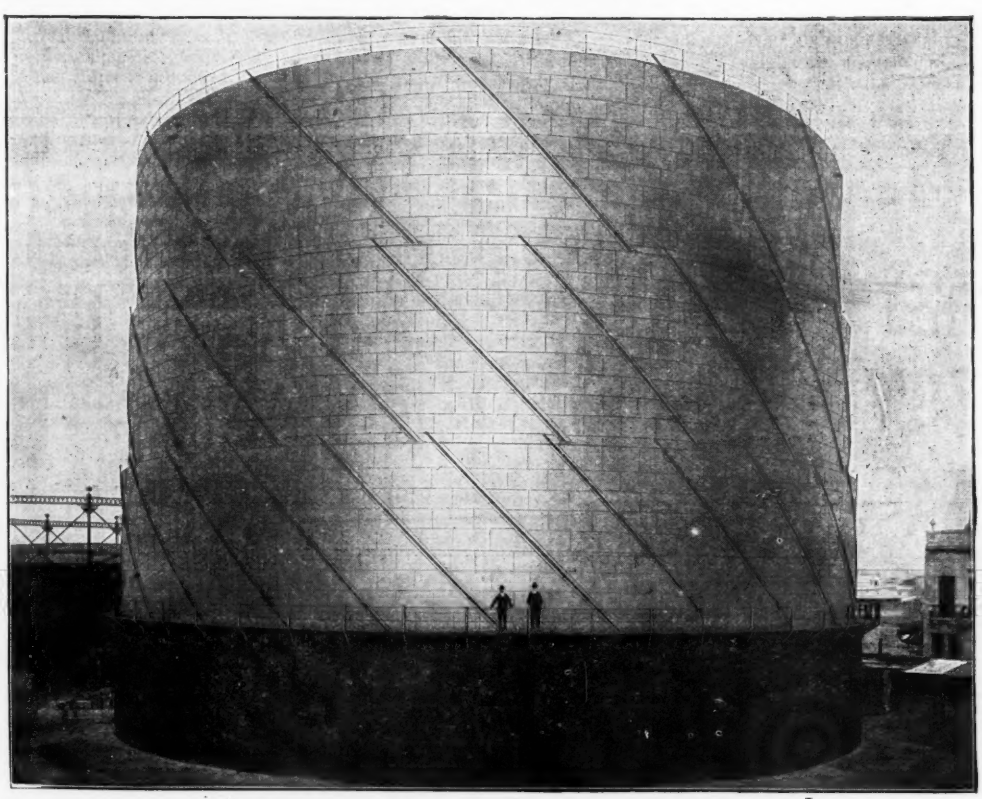

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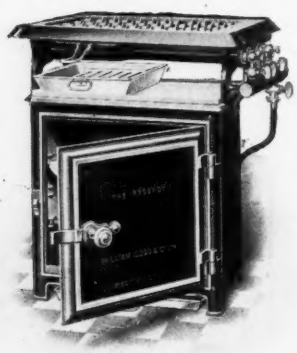

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	Hot Plate.	Inside Oven.	Outside Over all.
High	5 ins.	13½ ins.	20½ ins.
Wide	18 ,,	12 ,,	18 ,,
Deep	12½ ,,	10 ,,	12½ ,,

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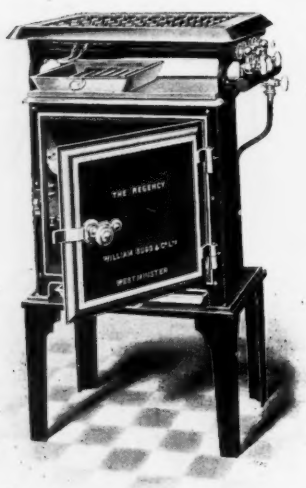

DIMENSIONS.

	Hot Plate.	Inside Oven.	Outside Over all.
High	5 ins.	13½ ins.	30½ ins.
Wide	18 ,,	12 ,,	18 ,,
Deep	12½ ,,	10 ,,	12½ ,,

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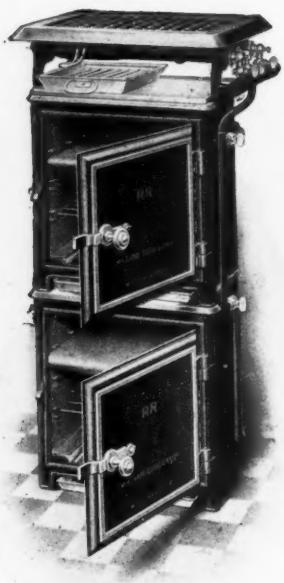

DIMENSIONS.

	Hot Plate.	Inside Each Oven.	Outside Over all.
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Deep	14½ ,,	10 ,,	14½ ,,

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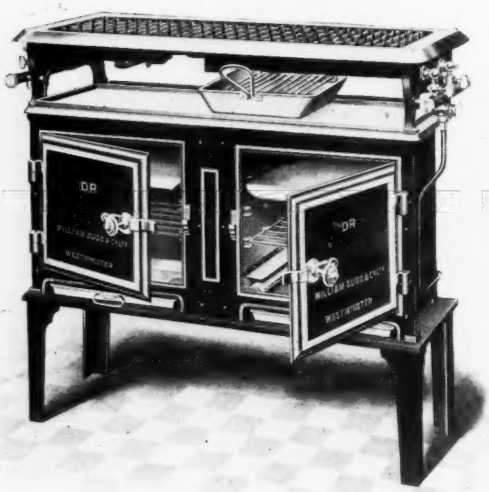

DIMENSIONS.

	Hot Plate.	Inside Each Oven.	Outside Over all.
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tions of pressure in the main with jumping lights and unequal supplies to other consumers.

(*b*) An adjustable die stock consists of an outer frame into which dies in halves may be inserted on triangular projections fixed on the frame. The dies are secured, as shown in fig. 11, by a screw A.

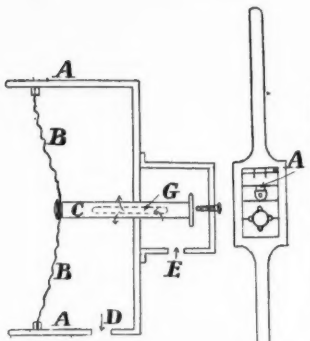

Fig. 10.

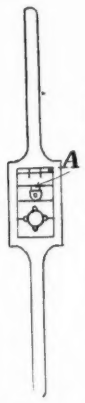

Fig. 11.

(*c*) One form of service-cleanser is shown in the sketch. The plunger A works in a cylindrical case, and consists chiefly of a leather cup, rod, and handle. The cup is so constructed as to permit air to easily pass it as the plunger is withdrawn, but is pressed tightly against the sides when the rod is forced downwards. The compression chamber is kept tight by the valve B opening in a downward direction, as shown. The plug in the compression chamber may be withdrawn, if desired, for the purpose of inserting a solvent for clearing out deposits of naphthalene.

(*d*) Piggott's expansion joint is a good type. X is a flange and socket piece, in which the movement owing to expansion or contraction takes place. W is a flange and spigot piece, which slides into the socket X. The packing rings Y are used to make the joint gas-tight. An angular collar S fits loosely on the spigot piece W, sliding easily into the socket piece. The bolts R are tightened up; thus bringing pressure upon the packing rings and making a good joint. A space T must be left between the socket and spigot, to allow for any movement of the pipes.

(*e*) A lead-wool joint is made as follows: The socket and spigot of the two pipes are first of all well cleaned, and the spigot driven home into the socket. Yarn is then inserted into the aperture between the two, and driven in with a yarning iron. The lead wool is now inserted in lengths of about the same diameter as the pipe, each being well caulked up with suitable setts and caulking tools. In this way, a sound joint is made.

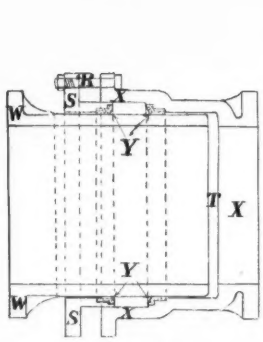

Fig. 12.

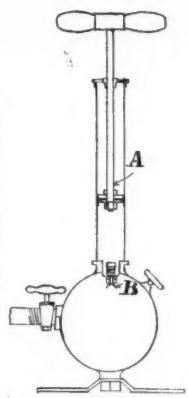

Fig. 13.

It is important to caulk up the lead wool in sections, and not first of all fill the joint before caulking.

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10. What are the common difficulties encountered in fixing brackets for outside shop suspension lamps, and the conditions which govern the position of such lamps? Describe, with the aid of sketch or sketches, the operation of attaching a shop suspension lamp to the masonry above a window casement, and state the tools and fittings required to complete the work.

The common difficulties encountered are:

(1). Shop sun blinds being in the way.

(2). Condition of wall, masonry, &c., to which it is to be attached.

(3). Name board of shop may be in the way.

(4). Iron beams or joists.

(5). Position of supply pipe to feed lamp.

(6). Sometimes difficult to get lamp at required height above pavement.

The conditions governing the position are as follows:—

(1). Type of shop to be illuminated.

(2). Position, shape, and number of windows to be illuminated.

(3). Lamps must be neat, and fixed to attain their object without being injurious to the eyes of customers or unduly attracting notice.

(4). They must conform in height from the ground, &c., to bye-laws of local authority.

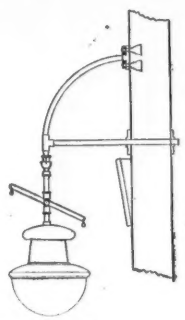


Fig. 14.

To fix a lamp, two square holes, from 2 to 3 inches deep, must be cut in the masonry above the shop casement; the holes being cut out rather larger inside than at the front, the latter being just large enough to admit the ends of two rag or Lewis bolts. It is better to use Lewis bolts, because, in the event of the lamp being removed, they are easier to take out. But, on the other hand, more skill is required in cutting the holes. The bolts are inserted, the opening covered with clay, and molten lead run in until the space is filled. The lead is caulked up, and all superfluous pieces chipped off. An iron plate, with two holes provided for bolts and a socket-piece projected from the centre, is fitted over the bolts and secured with nuts. A bend to the required shape is made out of steam tube and screwed into the socket on an iron plate. A tee is attached to the bottom of this; one branch receiving the gas-supply pipe, and the other outlet being connected to the lamp with cup-and-ball joint. The gas-supply pipe is brought through the wall to the tee, and secured with back-nuts or plates screwed to the woodwork. In addition to supplying the lamp with gas, this acts as a stiffener in the supporting arrangement.

The tools and fittings required will be the following. Tools: footprints, hammer, chisels, drill, ladle, pan, and furnace for melting lead, pipe wrenches, brace and bit (probably), caulking tools, white lead. Fittings: steam tubing, tees, connector, cup-and-ball joint, iron plate, rag or Lewis bolts and nuts, lead bend (as in sketch), and back-nuts.

THE EXTRACTION OF NAPHTHALENE BY WATER GAS TAR.

By G. M. Gill.

This article is written, not with the idea of putting forward any new method of extracting naphthalene from gas, but merely to record a few facts experienced in the removal of this impurity by the use of carburetted water gas tar. It is now eighteen months since the writer first adopted this method of extraction; and he is indebted to Mr. H. O. Carr, the Chief Engineer of the Wandsworth and Putney Gaslight and Coke Company, for suggesting its use and for supplying various details.

For some years past a number of gas engineers, to judge from data published in the Technical Press, have obtained by this means relief from this fickle hydrocarbon; the only difference in the method of its use being that some wash the gas while still hot and others when cold. But in any case, whether used hot or cold, it has in all cases given a good account of itself, though the few grains left in the gas after washing have been the cause of inducing some to use further solvent to extract the remainder of the naphthalene from the gas.

Cause of Deposition.

It is undoubtedly a fact that, in districts where a mixture of coal gas and carburetted water gas is supplied, the trouble from the deposition of naphthalene is not nearly so acute as in districts where the former only is supplied. It is, too, well known that under certain conditions naphthalene is very readily deposited; sudden cooling of the gas being one which is specially conducive to such deposition. It would probably be impossible to find another district situated similarly to that supplied by the Wapping Gas-Works, which is itself built on an island, and must perforce supply gas in mains either over or under water. In this case the trunk mains, of which there are three, are laid under waterways, in which position the effect caused by sudden cooling is given the fullest play.

Clearance of Mains.

The result of this peculiarly unfortunate position (as regards deposition of naphthalene) was that considerable quantities of this deposit had every few months to be removed by some means. An excellent temporary method was to steam the main thoroughly (steam being supplied by a portable boiler), at the same time vaporizing a quantity of spirit—the two being forced into the main under pressure for a number of hours. After this process, the main would continue to supply the required quantity of gas until again blocked.

Before proceeding further, it will be advisable to describe a method by which a quantity of naphthalene was easily removed from two mains which were partially choked. A syphon cart was filled with gas oil (as used for carburetted water gas manufacture), which was then raised to a high temperature by means of a steam-pipe submerged in the tank. The hot gas oil was then run through a 2-inch hose pipe into the main at the highest point of the part to be cleared, and was pumped out saturated with naphthalene as soon as it appeared at the syphon. At first it would take quite 24 hours to run down; but the process was continued until the oil flowed down almost as quickly as one could walk. This proved that the main was, to all intents and purposes, quite clear.

Method of Extraction.

To extract the naphthalene from the gas, an ordinary tower scrubber, 35 feet high by 20 feet in diameter, filled with coke and fourth in a series of five (two of which are split) is used. A quantity of about 700 gallons of tar is kept in circulation by an Evans "Reliable" pump. This quantity of tar is used for seven days without change, to wash about 17 million cubic feet of coal gas, after which time the tar shows signs of throwing off into the gas naphthalene that was already extracted. The speed of the pump is automatically regulated by a steam-valve operated by a rod attached to a float in the suction-tank. This was fitted owing to a difficulty in properly adjusting the pump.

For many months only one naphthalene test was taken daily,

INLET OF SCRUBBER (Grains per 100 Cb. Ft.).
AMOUNT OF NAPHTHALENE (Grains per 100 Cb. Ft.) EXTRACTED BY SCRUBBER.
OUTLET OF SCRUBBER (Grains per 100 Cb. Ft.).
TEMPERATURE (°F.) OF GAS ENTERING SCRUBBER.

and that on the outlet of the scrubber. The tests showed that the gas on the outlet contained naphthalene amounting to from 4 to 11 grains per 100 cubic feet. Since November of last year it has been our practice to test the gas for naphthalene both on the inlet and outlet; and these tests support the statement that water-gas tar is fairly efficient when used for this purpose.

Efficiency of the Scrubber.

To deal in some detail with the above diagram it will be noticed that about two-thirds of the naphthalene has been consistently extracted. It will also be observed that on days when more naphthalene was found present in the gas more was extracted by the tar than on days when there was a less quantity. For instance, on all the occasions when 22·5 grains or more per 1000 cubic feet were found on the inlet, an average of 15·9 grains were extracted; while on the days when 19·5 grains or less were present, an average of 12·5 grains only was removed by the tar. If the two top lines of the diagram are closely compared, it will be seen that the naphthalene on the inlet and the naphthalene extracted invariably fluctuate concurrently with each other. So, too, does the naphthalene in the gas on the outlet, though to a much smaller extent.

Effect of Temperature.

It would appear that the temperature of the gas on the inlet to the extractor, as shown in the bottom line of the diagram, has no bearing on the efficiency of the washing process. It will be seen that the temperature varied from a minimum of 52° Fahr. to a maximum of 88° Fahr. without the gas on the outlet or the amount extracted showing any great variation. Thus it would be inferred that the question of temperature might be safely ignored. But the writer cannot go so far as to make such a statement, as during last summer it was found that as the temperature of the gas rose above 70° Fahr., so did the naphthalene in the gas on the outlet. It is evident that, to account for this discrepancy, there must be some difference in the conditions under which the gas was extracted last summer and during the past few months, as in both cases the temperature of the gas has not exceeded 89° Fahr.

That the efficiency of the washer was reduced when the temperature of the gas on the inlet rose above 70° Fahr. may be due to the fact that above this temperature considerable condensation takes place in the washer—diluting the tar with ammoniacal liquor, and reducing its efficiency. Lately it has been our practice to separate this liquor, and run it off regularly—thus maintaining the tar in its proper state. Last summer this point had not been discovered; and it is to this fact that the writer attributes the recent non-variation of the naphthalene on the outlet in face of considerable variations in the temperature.

Conditions for Maximum Efficiency.

As to the efficiency of water-gas tar as a naphthalene extractor, it is quite conceivable that under the best conditions a larger proportion than two-thirds of the naphthalene might be removed. It is obvious that many factors would cause variation in the efficiency, such as the washing area and its condition, the capacity of the pump circulating the tar, the state of the tar as regards freedom from liquor, the quality of the tar, and the aforementioned question of temperature. All these details need confirmation by experience before definite statements can be made. It is in any case obvious that the washing area, and the circulation of tar per 1000 cubic feet of gas should be as great as possible, and that the tar should be practically free from liquor. It is quite probable that the conditions under which the writer has carried out the extraction may not be as favourable as is required for maximum efficiency.

One of the chief advantages in using water-gas tar (in works making carburetted water gas) lies in the fact that the extraction is really carried out at next to no cost. It is only necessary to set aside part of the washing or scrubbing plant, which in our case is about one-fourth of the whole. If this cannot be spared it does, of course, entail some expenditure on new plant. The cost of working it is, however, infinitesimal; for the amount of labour involved may be disregarded, and the raw material is at hand ready for use. Its adoption for this purpose not only does not cost anything, but the naphthalene extracted actually increases the quantity of tar, and is sold as such.

Result of Extraction.

Ever since the naphthalene was first extracted, various parts of the plant, and especially the inlet and outlets of the meters, have been kept entirely free from this deposit; whereas before it was a daily task to clear certain parts.

The effect on the district mains has been a gradual disappearance of the naphthalene. Mains which before were partially choked have become quite free from it, and those situated in the worst positions (under docks) have not required any attention whatever since the gas has been washed. The effect on the services has not been so satisfactory as that on the mains, although there has been some improvement. The writer attributes this to the fact that the gas containing so small a quantity of naphthalene has absorbed some of that lying in the mains, and has carried it on to deposit it in some service. That the gas has absorbed much of the naphthalene from the mains is certain, as otherwise where has the naphthalene disappeared to, and what could be more probable than that the gas passing into a service pipe, situated in a colder position than the main supplying it, would here deposit part of that which was absorbed. For this reason, it is quite probable that where naphthalene is extracted for the first time at least two years may elapse before the district mains and services become wholly free from its presence.

[In a future article, the writer proposes to deal more fully with some of the details involved in the extraction of naphthalene by this means.]

The Life of a Gas-Meter.—The question is sometimes raised as to the life of an ordinary meter. Messrs. Thomas Glover and Co. have just had returned to them for examination a meter which has been in constant use since 1869 (a period of 41 years), and has been tested and stamped "correct" by the Middlesex County Council. This meter has never been repaired during the long period named.

Society of Chemical Industry.—At the annual meeting of the Society, held in Glasgow last Wednesday, Mr. Thomas Tyrer, the Hon. Treasurer, was presented with the Society's medal, in recognition of his distinguished services to chemical industry. The General Secretary (Mr. C. G. Cresswell) submitted the Council's report, which showed that the number of members on the register was 4299. The new President is Mr. Walter F. Reid.

Waste Gases.—It is interesting to note (says the "Journal of the Society of Arts") the progress that is being made in Germany with regard to the proposal to supply the towns with the waste gases from coke-ovens. The Essen Town Council are discussing the advisability of accepting the offer of the Rhenish Westphalian Electrical Company to supply them with gas. A similar offer has been made to the Municipalities of Solingen, Wald, Grafrath, Pemscheid, and Lennep; and a Special Committee is to be appointed from the Councils of these towns to go into the matter. The gas will be derived from the coke-ovens in connection with the Stinnes mines, and supplied at 2½ pf. per cubic metre (say 9d. per 1000 cubic feet). Barmen and Mülheim-on-Ruhr have already entered into a similar agreement with Thyssen and Co.; and Bochum has accepted proposals from the Krupp Company.

KÖNIGSBERG GAS-WORKS.

(*Concluded from p. 32.*)

Comparison of the Different Methods of Making Gas.

THE descriptive account of the development of the Königsberg Gas-Works, which was presented to the members of the German Association of Gas and Water Engineers on the occasion of the annual meeting at Königsberg last month, contains a table showing the comparative cost in capital expenditure, labour, fuel consumption, and area of land occupied, of the different types of gas-making plant which have been tried at the Königsberg Gas-Works. This table is here reproduced, subject to the conversion of the metric measures, &c., into English.

The remainder of the descriptive account is chiefly devoted to figures relating to the industrial development of the gas undertaking. This is divided into two periods—viz., from the construction of the first gas-works in 1852 to the construction of the new gas-works in 1902, and from 1902 to the end of last year. At first the gas undertaking was credited with 10,000 thalers for the gas supplied for public lighting; but since 1862 the gas has been supplied for public lighting gratis. In addition to this free supply of gas, the Corporation have benefited from the gas undertaking by surpluses which have varied from year to year. In 1869, a reserve fund was created; and in 1878 to 1881, 20 per cent. of the profit of the undertaking was placed to reserve. The site of the old gas-works was disposed of about 1902 for building purposes at a considerable profit, which was applied in part-payment of the cost of construction of the new works. Since 1902, when the new

COMPARATIVE FIGURES FOR DIFFERENT TYPES OF GAS-MAKING PLANT.

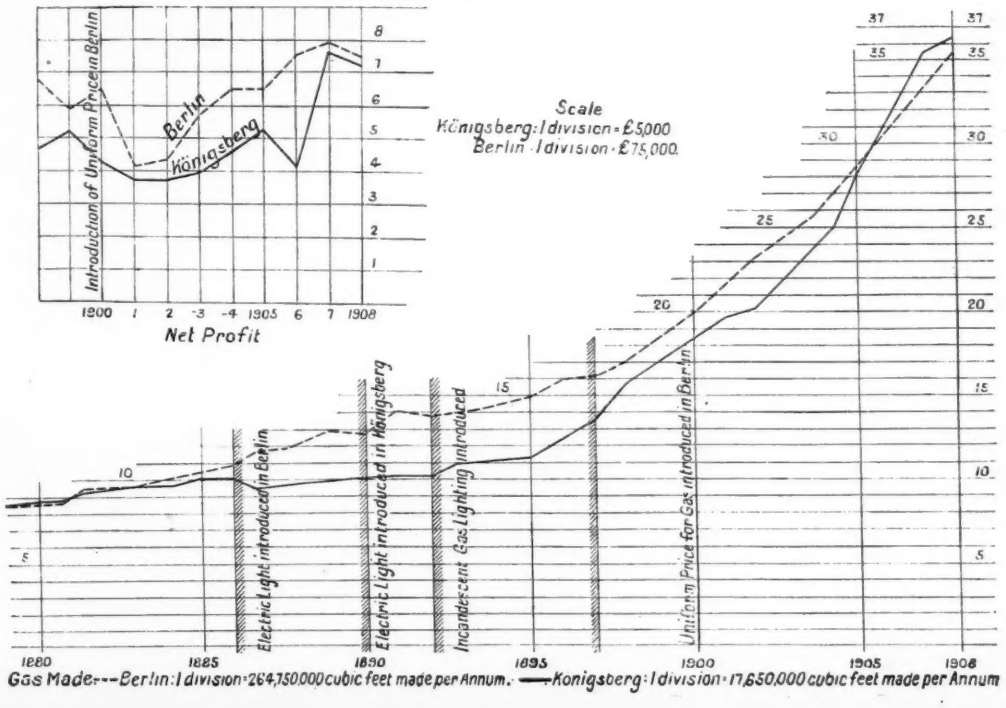
—	Direct-Fired Settings of Seven Horizontal Retorts (1902).	Settings of Nine Inclined Retorts (1902).	Settings of Four Large Inclined Chambers (1908-9).	Water-Gas Plant (1893).	Water-Gas Plant (1906).	
					Simple Water Gas.	Carburetted Water Gas.
Number of units	32 settings	24 settings	6 settings	2 generators	2 generators	1 generator
Make per 24 hours (cubic feet)	1,356,000	2,119,000	1,589,000	466,000	777,000	706,000
Make per 24 hours per 100 square feet of area of ground covered by buildings and plant (cubic feet)	10,827	12,102*	19,174	27,340	100,248	90,245
Number of shifts per day and duration	Two (eight hours)	Three (eight hours)	One (nine hours)	Three (eight hours)	Three (eight hours)	Three (eight hours)
Make of gas per man employed, including charging, coke removal, clinkering and charging producers, cleaning ascension pipes, &c. (cubic feet)	21,190	50,502	264,870	155,390	258,972	235,416
Cost of plant per 1000 cubic feet of gas made per diem	£18 8s. 1d.	£22 7s. 1d.	£18 8s. 1d.†	£16 3s. 4d.	£8 7s. 4d.	£7 11s. 6d.
Fuel consumption per 1000 cubic feet of gas made, as used according to the works' records, not in special trial runs (lbs.)	47·4 (Coke containing moderate proportion of moisture.)	40·6 (Red hot coke.)	37·4 (Coke containing exceptionally high proportion of moisture.)	43·7 (Coke containing moderate proportion of moisture.)		

* This figure is lower than it should be, owing to the house having been erected of large dimensions, with a view to the subsequent installation of longer retorts.

† Including coke-bunkers and coke-conveyors to the producers.

works came into operation, only comparatively small sums have been taken from the gas-works' profits for the relief of rates; but large amounts have been written off for depreciation, and gas has continued to be supplied gratis for public lighting.

It is pointed out in regard to the industrial development of the gas undertaking, that it is largely dependent on the general industrial position of the population. The prosperity of Königsberg is dependent on agriculture, on the export traffic by way of the Baltic Sea, and on the trade with Russia by means of the trunk railways through Eydtkuhnen and Prostken. The industrial undertakings of Königsberg and the rest of East Prussia are, therefore, far more at the mercy of political and legislative influences than are those of the rest of Germany. Hence from time to time there have been fluctuations in the prosperity of the gas undertaking. The population of Königsberg amounted in 1858 to 87,207, and the consumption of gas per head to 612 cubic feet. By 1895 the population had grown to 172,796, and the consumption of gas per head to 1147 cubic feet. Thenceforward the increase in the consumption of gas proceeded at a far greater rate than did the increase in the population. In 1908, the population was 236,486, and the consumption per head had risen to 2720 cubic feet. Apart from the industrial condition of the town and the improvement in the social status of the inhabitants, the increased consumption of gas was largely due to the technical development of the gas industry and of the burners and apparatus used for lighting and heating by gas. It is interesting to notice that when gas supply started in Königsberg in 1852, the unit of measurement was the English cubic foot. In 1855, the Prussian measures were introduced, and the Prussian cubic foot, which was to the English cubic foot as 1 : 0·916, came into use. This


Introduction of Uniform Price in Berlin
Berlin
Königsberg
Net Profit
Scale
Königsberg: 1 division = £5,000
Berlin: 1 division = £75,000
Electric Light introduced in Berlin
Electric Light introduced in Königsberg
Incandescent Gas Lighting introduced
Uniform Price for Gas introduced in Berlin
Gas Made:—Berlin: 1 division = 264,750,000 cubic feet made per Annum. —Königsberg: 1 division = 17,650,000 cubic feet made per Annum

necessitated alteration of the meters in use. Considerably later the change was made from the old system of measures to the metric system. Until 1885 there was a uniform price for gas for all purposes, with a percentage rebate to large consumers; but in 1886 it was decided to introduce differential prices, and charge for gas for lighting purposes 4s. 6d. per 1000 cubic feet, and for gas for other purposes 3s. 5d. per 1000 cubic feet, and do away with the rebate system.

The electricity works were erected at Königsberg in 1890. This, and the introduction of the incandescent gas-burner somewhat later, caused a reduction in the output of gas for lighting purposes; but the total gas consumption increased year by year in at least as great a proportion as the increase of population. The use of gas for cooking ceased to be a luxury, and began to equalize the loss in consumption for lighting purposes. In 1898, it was decided that one lighting burner should be allowed on gas supplies at the lower price charged for heating or power purposes when either gas was in constant use for cooking and heating or for the driving of engines. In 1900, a decision was made to increase the price of gas used for gas-engines which were employed for producing electric light to the price charged for gas for lighting purposes. In 1902, however, in deference to the altered conditions of lighting and heating, it was decided to modernize the conditions of supply. After that year, no minimum consumption was stipulated for. Moderate meter rents were charged—*e.g.*, 7d. per quarter for a three-light meter—and two lighting burners were allowed on supplies at the lower charge made for gas for heating and cooking purposes. Accounts were rendered at intervals of six weeks or, if desired by consumers, at shorter intervals. No deposit was required from users of prepayment meters, for which the same rent was charged as for ordinary meters. These new conditions of supply have been fully justified by the results. In Königsberg it has been found that, contrary to English views, the economical value of the prepayment meter lies in the method of keeping accounts. Since 1902, the gas consumer can have either a prepayment or an ordinary meter according to his desire, and in both cases buys his gas at the same price. The fact that he is able through the prepayment meter to pay as he goes along has been a great inducement to the poor man to adopt gas as fuel. In Königsberg at the present time gas has in the general opinion become the fuel of the lower classes. The smallest houses now are fitted with gas supplies. Some particulars in regard to the consumption of gas through prepayment meters were given in the abstract translation of a paper by Herr Kobbert, which was published in the "JOURNAL" a few months ago (see "JOURNAL," Vol. CVIII., p. 470).

In 1905, the price of gas used for lighting staircases, landings, and courtyards was reduced to that charged for gas for heating purposes. The cost of current had in the meantime continually been reduced, and the amount of gas sold at the higher price charged for gas for lighting purposes began to fall off, and numerous large meters were kept only to provide a reserve supply of light. To meet the latter cases, the rents for the larger sized meters were considerably increased in 1908. It was also arranged that more than two lighting burners could be used on a supply for which the charge was made at the lower price adopted for gas supplied for heating purposes, provided a monthly supplement of 3½d. was paid for each lighting burner after the first two, irrespective either of the gas consumption or the time of year. In this manner, the diminution in the receipts of the gas undertaking, which was at one time threatened, was checked, and the adoption of a uniform price of gas for the smaller consumers was practically secured. The development in the consumption of gas has taken place at substantially the same rate as that of the gas consumption from the municipal works of Berlin, though the area supplied by the latter is a considerably more productive one. The comparison of the rate of increase in gas consumption in Königsberg and Berlin is shown in the diagram on p. 111, in which the dates at which changes were made in the rates charged for gas and the conditions of supply are indicated.

The new tariff had the effect of making the difference between the smallest day's consumption in the summer and the heaviest day's consumption in the winter less than formerly. Consequently, the ratio of the gasholder capacity required to the annual output of gas had become smaller, and all the works' apparatus was considerably better utilized throughout the year than previously. Notwithstanding the great increase in the make of gas, the coke produced was disposed of without difficulty, the price obtained varying not only according to the price of coal, but according as the winter was mild or severe. Latterly, however, the effect of the weather conditions on the sale of coke has been less marked, owing to the growing preference of the public for coke on account of its cleanliness, and to the increase in the number of central heating plants, the consumption of which varies considerably less with the weather than does that of a number of separate stoves. The convenience of central heating installations has improved the standard of heating demanded by the public, and this has reacted on the sale of gas for heating purposes. The advantages afforded by gas for heating purposes in readiness of control of the temperature and in the avoidance of any store of fuel on the premises, have resulted in a big extension of the consumption of gas for heating purposes. On a large scale gas has been introduced in Königsberg for the heating of two churches, and also the large banqueting hall of the Thiergarten (in which the inaugural reception and the banquet of the recent meeting of the German Association were held). The facts that the greater proportion of the gas used for heating purposes is consumed in the daytime or on Sundays, and that the maximum hours' consumption has been almost unaffected by the increased use of gas for heating, led the administration of the Königsberg gas undertaking last year to revise the conditions of sale of gas in the following manner: A 20 per cent. rebate is allowed off the ordinary price of gas for heating purposes for gas used solely for heating rooms. In cases where gas for both cooking and heating is registered through one meter 20 per cent. rebate is allowed in the winter months on gas consumed in excess of 5250 cubic feet per month.

The description of the Königsberg Gas-Works concludes with a review of the names of the consulting and constructing engineers who have been engaged from time to time in the extensions. Since 1902, a chemist has been employed on the works to supervise the working of the chemical processes. From 1902 to 1906, the chemist was Dr. Wolffram, who read a paper on "Development in Gas Purification" at the recent meeting of the German Association; and from 1906 onwards, the chemist has been Dr. Hurdelbrink, who read a paper at the same meeting on "The Washing of Ammonia and Sulphuretted Hydrogen from Coal Gas." Abstract translations of these two papers were given in the "JOURNAL" June 28, p. 959. The position of Manager of the gas undertaking has been held by Herr Kobbert since 1902.

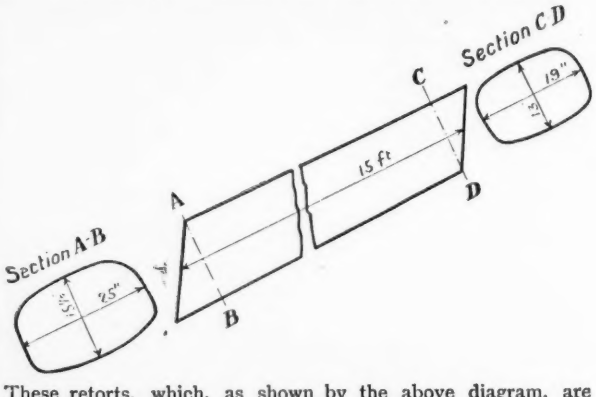
BRUSSELS MUNICIPAL GAS-WORKS.

As mentioned in a previous issue of the "JOURNAL," the programme for the recent gathering of gas engineers in Brussels included a visit to the gas-works of the Municipality, of which M. Aerts is the General Manager. For the convenience of the visitors, a descriptive pamphlet had been prepared, from which we extract the following particulars.

The City of Brussels has been lighted by gas since Aug. 24, 1819. The first concession was granted to the Société Meeus, who carried on the service until 1844, when it was taken over by the Imperial Continental Gas Association. The works were situated in the Rue des Echelles, near the centre of the city. When, in 1873, the Communal Administration had under consideration the renewal of the concession, they decided on removing the works, and subsequently on having the gas supply carried on under their control. This arrangement came into operation on Sept. 1, 1875. For some years, however, the supply of the city has been entirely in their hands.

The works are situated at Schaerbeek, on the banks of the Willebroeck Canal; and they are connected with the neighbouring railway line, which has a station at the above-named place. They have been gradually enlarged in order to meet the increasing demands made on them, and now occupy an area of 50 acres; and their productive capacity can be raised to 14 million cubic feet of gas per day. They consist of two complete gas-works—one erected in 1875, and the other brought into use in 1900—plant for the manufacture of carburetted water gas, a tar distillery and sulphate of ammonia plant, compressed fuel plant, and gasholders.

The four retort-houses in the old works contain six benches of twelve settings of horizontal retorts, and two benches of ten settings of inclined retorts on the Coze system. In the new works are four benches of inclined retorts. In No. 1 bench there are eight settings of nine inclined conical retorts 15 feet long, on the system devised by M. Gennotte, the Chief Engineer of the works.



These retorts, which, as shown by the above diagram, are tapered at both sides and at the bottom, the roof being inclined at an angle of 33°, are charged with 390 kilos. (858 lbs.) of coal, which remains in them for 7¼ hours. The quantity of coal carbonized per 24 hours is 1291 kilos. (2840 lbs.), or 286 kilos. per metre run, compared with 240 kilos. in the cylindrical inclined retorts. The difference in favour of the conical retorts is 211 kilos. per 24 hours. The yield of gas is 30·25 cubic metres (1068 cubic feet) per 100 kilos. (220 lbs.) of coal; its illuminating power being 95 litres (3·35 cubic feet) per carcel (9·6 candles), compared with the Paris standard of 105 litres (3·7 cubic feet), and the calorific power is 613 B.Th.U. per cubic foot. Carbonization is quite easy with these retorts, as, owing to their shape, the coke comes out without any

"tickling" or poking; and it is much larger and harder than that produced in cylindrical retorts. The supply of primary air for heating these retorts is controlled by a regulator devised and patented by M. Bromham, the Second Engineer, who is Manager of the tar-works. By the use of this appliance, economy of fuel is effected, there is regular temperature during the whole period between two clinkerings, the life of the refractory material is prolonged, and there is greater regularity in the production of gas. The coals come principally from Westphalia, the Pas de Calais, Durham, and Yorkshire. Coals arriving by boat are discharged by two cranes operated by electricity, each of a capacity of 50 metric tons an hour. They are conveyed to the store in electrically worked trucks of special make, which discharge their contents without stopping. The trucks carry 1200 kilos. of coal, the motor is 3-H.P., and the speed is 12 kilometres (7·2 miles) per hour. The current used in conveying a ton of coal from the boat to the point of discharge in the store is 1 kilowatt-hour. The stores will contain 25,000 tons, which is sufficient for about 45 winter days' consumption.

The condensing plant consists of cast-iron vertical pipe condensers, and sheet-iron water-cooled condensers, the design of M. Aerts. It is stated that, though they have not been cleaned for seven years, they do not contain any thick tar or naphthalene. The washers are Kirkham's; and the exhausters are of the pump and rotary types. Four sets of multitubular boilers furnish the steam required on the works. Each of the purifier boxes contains 10 tons of oxide of iron. They are movable, and are raised and emptied by means of travelling cranes worked by electric motors. The purified gas is measured by seven station meters, each of 1¾ million cubic feet capacity, before it passes into the holders, of which there are eight, ranging from 350,000 to 2,000,000 cubic feet capacity, in metal tanks.

In 1894, plant on the Humphreys and Glasgow system, of a capacity of 3½ million cubic feet per day, was installed for the production of carburetted water gas. The oil used comes from the Northern States of America, and 34 kilos. of it are needed per 100 cubic metres (3530 cubic feet) of gas; the yield of gas per 100 kilos. of oil being 294 cubic metres (10,382 cubic feet). The production of gas per apparatus in 24 hours is 20,000 cubic metres (777,000 cubic feet). Buildings to contain tar-distilling plant equal to dealing with 12,000 tons of tar per annum have been constructed, and apparatus for about half this quantity has been put in. The tar is conveyed by tank-waggons into reservoirs having a total capacity of 2000 tons. It is afterwards filled into stills of 12 tons capacity; and distillation is effected, on an average, in 15 hours. The products are light oils, carbolic acid oils, creosote, anthracene, green oils, naphthalene, and pitch. Here there is in use M. Bromham's patent centrifugal machine for drying naphthalene and sulphate of ammonia, which he brought under the notice of his French colleagues in a paper read at the meeting of the Société Technique.* The basket, or drum, of the machine is about 6 ft. 6 in. in diameter, and works at the rate of 750 kilos. (about 15 cwt.) of dried naphthalene per hour.

The coke is broken, classified, and put into sacks or waggons. There are on the works two coke-breakers, equal to dealing with 27,500 bushels per day. There is also a clinker-washing plant, in which the unburnt coke is mechanically separated from the clinkers and ashes coming from the retort-furnaces. The ammoniacal liquor is utilized in the manufacture of sulphate by the Solvay process. The breeze is used for the production of compressed fuel, something like 10,000 tons of which are made yearly, and employed in the heating of the generator furnaces. Almost all the ashes and clinker are sold to be crushed for the manufacture of mortar and the maintenance of roads.

There are employed on the works seven locomotives, 41 steam-engines, 16 gas-engines, and 36 electric motors. The current is delivered from the city central station at a pressure of 5000 volts, and it is brought down to 250 volts by transformers.

The gas is conveyed into the city by one 34-inch and two 40-inch mains. Brussels is a city of different levels; and, to regulate the pressure, one governor, with return pipe, is employed for the lower portion, and seven special governors for the higher parts. The total length of mains is 123 miles. The increase which has taken place in the consumption of gas during the past 23 years is shown in a tabulated statement in the pamphlet from which most of the particulars here given have been obtained. In 1886, the quantity of gas sold to 173,123 inhabitants was 517½ million cubic feet, or at the rate of 3000 cubic feet per inhabitant. Last year the quantity sold to 194,310 inhabitants was 1422⅜ millions, or at the rate of 7310 cubic feet per head.

The staff of the works consists of three engineers, who have thirty assistants (inspectors, supervisors, clerks, &c.); and the workmen employed number 650 in winter. The usual provisions are made for their comfort and cleanliness; and they have the benefit of provident and pension funds—the latter being in connection with the State fund. A franc per month is retained from their pay, and the State contributes twice this sum. A workman 65 years of age, or invalided, has the right to a minimum pension of 365 frs., with an addition of 15 frs. per annum in the event of more than 25 years' service, up to from 547 or 550 frs. Eleven dwelling-houses have been constructed for the use of the employees; and workmen can have two, three, or four rooms at a rent of 10 to 13 frs. a month. The children receive instruction up to ten years of age in a school attached to their dwellings.

*An abstract translation of the paper appears in another column.—Ed. J.G.L.

THE FOREST (BRUSSELS) GAS-WORKS.

(*Concluded from p.* 25.)

Exhausters, Washers, and Purifiers.

The gas produced in each of the two benches of inclined and vertical retorts first passes through foul mains, which, as a rule, are of riveted wrought iron, 24 inches diameter, provided with valves arranged so that the length traversed by the gas can be modified in accordance with the outside temperature. The two currents of gas unite on entering the first condensers, which are placed in the washer-house. These condensers, of which there are two, are cooled with water, and each has a total cooling surface of 281 square metres, of which 34 square metres are cooled by air. They are of rectangular section, which allows of economy in space. The gas then passes through three Beale two-blade exhausters, each connected with a steam-engine, and each having a capacity of 1700 cubic metres per hour. As a rule, two of these exhausters are in use. Here, as elsewhere, their speed is kept proportional to the make of gas. To do this, the steam regulator is controlled by the action of the gas pressure through a bell which is placed on the suction main of the exhausters. This is done, however, in the case of one only; the other being worked at a constant speed.

The gas proceeds along a main (provided with electric indicators of any abnormal pressure) to the washer-house, through which it passes in the following order: Pelouze and Audouin condensers, naphthalene washers, second condensers, and ammonia washers. The house contains three sets of plant, each capable of dealing with 50,000 cubic metres of gas per day. The Pelouze condenser is completely enclosed, and has a circular drum. In order to regulate the pressure, all that is necessary is to remove the upper cover and load or lighten the bell. The level of liquid can then be seen from the outside by means of a sight-glass inserted in the outside wall. The naphthalene washer (made by Holmes) is of the rotary type, and similar to the "Standard," except that the wooden blades are replaced by brushes (of piassava fibre) which rotate against the fixed parts, breaking up the gas, which is thus compelled to pass through them. It is then brought into intimate contact with the washing liquid—in this case anthracene oil. This washer is of the four-cell type.

The tank in which the raw oil is stored is under the washers, into which the oil is pumped by a small steam-pump. The oil, saturated with naphthalene, then passes away to the tar-tanks. The second condensers reduce the gas to 15° C. (60° Fahr.), and are similar to the first. Two of them are used in series. The ammonia washers are also of the Holmes type, and are built to be used later as cyanide washers. They contain seven cells. The whole of the necessary motive power for these washers is provided by a 10-H.P. steam-engine. A similar engine is kept in reserve; and, as an additional safeguard, the mains are provided with a number of hydraulic valves. In the washer-house there is also a small ventilating turbine, of 0·5-H.P., and an air-motor for blowing air into the mains, in order to effect continuous regeneration in the purifier boxes.

The purifier-house is built with two floors, occupies a site 26 metres by 34 metres in extent, and is 11·05 metres high to the springing of the roof. The purifiers are placed on the upper floor. They are six in number, and are arranged in two series—one of four purifiers placed in a square in the farther part of the house, and the two others forming the second series. All are similar in type and of the same dimensions—viz., 9·144 metres square and 1·65 metres in depth. They have four layers of "Bamag" grids; the gas being at present divided into two streams on entering the box. One of the inlets is above, and the other below; while the outlet is in the middle. Those of the same series are connected by a central distribution, by which any particular box of the series can be cut out, the others continuing to be used; while any purifier can be placed first in the series, the general direction of the gas in the others remaining the same. This combination allows of economical working, since the purifying material can be completely utilized. Each distributor is provided with a bye-pass sealed by a hydraulic valve. The lower floor, which is on the ground level of the works, is used for revivification—an arrangement which allows of charging and discharging the purifiers with very little manual labour.

The purifiers are provided on the lower side with two shoots, down which the spent oxide is shovelled, and falls into small trucks that convey it to any part of the floor. When re-charging the purifiers, the oxide is loaded into a small truck which is raised to the upper floor by a hydraulic lift. The truck passes directly from the elevator platform along a gangway running by the sides of the boxes, and can be brought to any given point, after which it returns by lift to the lower floor. A small platform placed on the charging-floor allows of each rise and fall of the lift being utilized, so that charging is done very rapidly. Though a single purifier contains 80,000 kilos. of oxide, it requires little more than eight hours to fill. The maximum speed of the gas through the oxide is 4·7 mm. per second in winter. On passing from the purifier-house, the gas enters the station meters, of which there are two, each of a capacity of 40,000 cubic metres per hour.

Gasholders.

There are three gasholders, of 5825, 13,600, and 35,000 cubic metres capacity respectively. The first two, owing to their small

size and pressure, can be used only during the times of limited consumption. The third, which is a three-lift holder with a wrought-iron tank, was built in 1899; the maximum pressure it can give is 220 mm. This holder stands on a foundation of slightly reinforced concrete. The total storage capacity of the works, as shown above, is 54,425 cubic metres; but as this is insufficient for the present output, a new holder is to be erected capable of containing 100,000 cubic metres of gas. The foundations, which, from the nature of the ground, have to be partly laid on piles, are now being proceeded with. The tank will be constructed and tested towards the end of the present year; while the holder itself will be erected in 1911, so that all will be in working order during the winter of 1911-12.

Water-Gas Plant.

Before describing the distributing system, reference should be made to the installation of plant for the production of carburetted water gas. This was constructed in 1900 by Messrs. Humphreys and Glasgow, and includes two sets, each producing 15,000 cubic metres of gas per 24 hours. Manipulation of the raw materials —the coke and oil—is done very simply. The coke reaches the entrance of the works in trucks, and is stacked on the ground. Thence it is taken by trucks, which are raised to the working floor by a hydraulic lift. The oil is stored in a tank of 900 cubic metres (about 200,000 gallons) capacity, which is filled as follows: On its arrival in the railway tank-waggons, the oil flows into an old boiler which is buried in the ground, and is connected with a pump supplying compressed air. Under the pressure of the air, the oil is forced into the tank above, which is surrounded by a large circular trench, in order to avoid the consequences of a possible fire. From the tank it is forced into the apparatus by a small "Duplex" steam-pump. The plant for the supply of compressed air for the manufacture of water gas includes two installations, each consisting of a high-speed Westinghouse engine and a centrifugal machine running at 2200 revolutions per minute. Each group is equal to the supply of two batteries. The gas produced, after having traversed the hydraulic washer, the tubular condenser, and the scrubber, passes into the gasholder. This is an old one of 5825 cubic metres capacity, and is used for storing a reserve of gas as well as for supplying the daily make. At the holder outlet the gas is drawn off by an exhauster of 1700 cubic metres capacity per hour, similar to those already described, placed alongside another of similar construction which is kept in reserve for both water and coal gas. It is then forced through a Pelouze and Audouin condenser of 30,000 cubic metres capacity per 24 hours; and afterwards it traverses the purifiers, of which there are six, each measuring 4·5 by 4·5 by 1·5 metres. These are at present fitted with four ordinary grids; but they are to be arranged on the "Bamag" system. After purification, the gas can either be sent into the mains leading to the holders, or into the main at the outlet of the exhausters, in order to dissolve the naphthalene which would tend to deposit in the purifiers. This happens occasionally, in spite of treatment of the gas with anthracene oil. The mixture of the two gases is thus complete.

The Governor-House.

This house consists, as usual, of a basement and one floor. The basement contains a tubular receptacle of square section (side measurement 80 cm.), in which, with the necessary valves, the outlet mains from gasholders 2, 3, and 4, as well as the inlets and bye-pass of the outlet governors, are joined up. Two of the latter (they number five in all) are 10 inches in diameter, two others are 20 inches, and the last 30 inches. The smaller mains are those used for supplying the more distant parts of the system; among them being Cortenberg, which is 25·5 kilometres from the works. The governors are Cowan's. Changes of pressure are produced by water. The vessel in the basement is connected with the works' main, by means of an enclosed regulator. The regulator opens only when, owing to some mistake in manipulation, all the outlets from the gasholders are closed.

Motive Power.

Up to last year, when the vertical retorts were installed, steam was the only motive power employed. It was generated by four boilers, three of the Cornwall-Galloway type with Fox tubes of 74 square metres heating surface, and a fourth of 120 square metres on the Piedbœuf system. The latter consists of a short Cornwall-Galloway boiler, with two furnaces surmounted by a large cylindrical multiple-tube boiler. Each of these two parts can be fed separately; but, as a rule, the lower portion is fed by the overflow from the upper. As regards the steam formed in the lower chamber, it traverses the upper one by means of a tube, and joins the steam formed in the latter. The advantage of this boiler is in the small amount of floor space it occupies relatively to its large heating surface. The boilers are all provided with the Bennis mechanical stoking system, which exactly imitates in its action the effect of a stoker with his shovel. The furnace forming part of the plant is provided with a forced draught, which allows of cheap fuel, such as coke dust, being utilized. A motor of about 1-H.P. is used for the mechanical stoking. These boilers supply the steam for the exhausters, and for the engines working the inclined retorts, the rotary washers, pumps, water-gas plant, and hydraulic accumulator. The consumption of steam by most of these engines is considerable, largely on account of the distances from the supply. The oldest and farthest are being replaced by electric motors. In addition to the first installation of steam-generating plant, there is a second, erected last year, to provide the motive power for the vertical retorts and the compression of the gas. These boilers, three in number, are on the Galloway system, with Fox tubes. The heating surface is 80 square metres per boiler. The steam-pipes of the whole installation are constructed in duplicate; and they allow of saturated or superheated steam being distributed either simultaneously and independently one of the other or in admixture. Like the boilers previously described, these latter are provided with machine stoking, operated by an electric motor, or steam as a reserve. This installation supplies the steam for the repair shop, as well as for the washers, vertical retorts, compressing plant, and electric station.

The electric plant produces an alternating three-phase current of 220 volts and 50 periods. This system was chosen as all the electric installations are intended to be united in the near future to an electricity distributing system which will be installed in some districts, and will take the form of the supply of a high-tension three-phase current. The station is now in course of construction. Transformers will also be installed at the gas-works, in order to bring down the tension to 220 volts. The generating plant now to be described includes two alternating turbines of 112 K.V.A., each having a turbine, an alternator, and a discharger, all on the same foundation and along the same axis. There is room to put down a third alternating turbine. The turbine is of "Electra" compound type, with two falls in pressure, each of which receives two falls in speed. It is of the same power, and, except for the regulator, similar to those which are employed for compression. Used as condensing turbines, these machines have given, for 167-H.P. effective, a consumption of 8·2 kilos. of steam per effective horse power for a pressure of 8·4 kilos., and 214° of superheating. The energy required to work the condenser is not included in these figures. The normal speed is 3000 revolutions, and is adjusted by a regulator fixed on the shaft of the turbine. In addition to this regulator, a disconnecting accessory is fitted, which cuts off the steam as soon as the speed exceeds 3000 revolutions. The number of periods being 50, and the speed 3000, the alternator is provided with only two poles. It is completely enclosed in a cast-iron frame communicating below with the terminal connections. The exciting current is supplied by a shunt apparatus of the four-pole type; excitation of the latter and of the alternator being secured by rheostats. Each installation is provided with an injector-condenser of the Westinghouse-Leblanc type, operated by an electric motor at a speed of 960 revolutions per minute. This condenser draws the water from a reservoir connected with the River Senne; the supply being filtered through gratings and finely perforated plates. The condenser discharges into another reservoir, which can be isolated from the Senne and emptied by means of a centrifugal pump in case of flood. The nearness of the Senne allows of the necessary water supply for the boilers being obtained at comparatively small cost. The water for the washers and condensers is pumped from a well, at a depth of 60 metres, by the air-lift process. The water reaches the condensers at a temperature of 12° to 14° C., and passes from the outlet into a tank, whence it is used for the boilers.

Residual Products.

The residual products—ammoniacal liquor, saturated anthracene oil, and tar—are collected in three brick tanks having a total capacity of about 88,000 gallons. The tar and liquor separate, and are pumped respectively to the tar distillery and the sulphate plant. Beside these brick tanks, there is one of cast iron, with a reinforced concrete cover, which holds 1,400,000 kilos. In this is stored only the tar bought outside, and treated in the distillery with the tar deposited in the other tanks. There is still another tank, in which is collected the tar coming from the water-gas plant. It consists of two cylindrical vats of wrought iron, sunk in the ground, and capable of containing about 30 tons.

Sulphate Plant.

Before the ammoniacal liquor is distilled, it is passed into a coke-tower, by which the tar is retained. The plant consists of three "Bamag" columns, which work continuously. One distils 250 hectolitres per 24 hours; the second, 150 hectolitres; and the third, 100 hectolitres. Each apparatus is provided with a heater, which is kept warm by the waste liquid escaping from the apparatus. The ammoniacal liquor, therefore, first passes through the heater, where it is raised to a considerable temperature, with the result that the distillation proceeds more readily. The fixed ammonia in the liquor is liberated by injecting lime into the lower part of the apparatus by means of a cataract pump; the quantity being regulated according to the quality of the liquor. Each purifier is provided with two saturators, which allow of distillation proceeding without intermission; the ammonia vapour being conducted into the second as soon as the first saturator is charged with sulphate. On its removal from the saturators, the sulphate is drained; and it is then dried by means of a turbine. The steam necessary for the distillation of the tar and the manufacture of sulphate is provided by two Galloway boilers, each of 60 square metres heating surface. The liquors are conveyed by steam-pumps, or by force-pumps working with compressed air.

Tar Distillery.

The tar from the works, mixed with that from other sources, is pumped into a reservoir holding 60 tons. It is there left to stand for the ammoniacal liquor to separate. The tar is then run off into four stills, each of a capacity of about 6 tons. The products

of distillation, which is done over a naked fire, are: (1) Ammoniacal liquor, which is taken to the sulphate works. (2) Light oils, which are sold in the crude state or are partly rectified for sale. (3) Naphthalene and creosote, which are allowed to cool, the naphthalene being drained and sent to the refinery, while the creosote oil is used for creosoting timber. (4) Anthracene oil, which is pumped into different reservoirs, and there left to cool, afterwards passing into a vertical hydraulic press. The cakes of anthracene thus produced are sold to dye-works; the green oil which filters off being used as a lubricant. (5) Pitch, which is allowed to flow off into a tank, and is sold for the manufacture of briquettes.

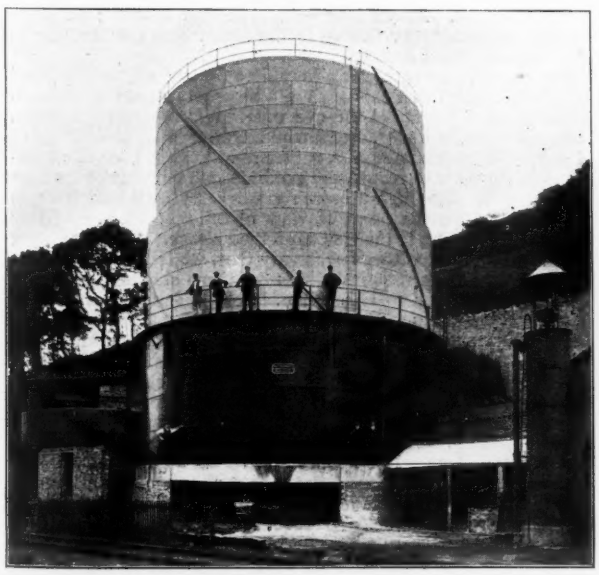
LABORATORY.

The laboratory stands away from the other buildings, and is well lighted and ventilated. The laboratory proper is on the ground floor, as are also the balance-room and the office. On the first floor is the photometer-room, into which pipes from all parts of the works, and even those which supply the different districts, are conducted. The gas from any given place can thus be tested for illuminating and calorific power. The photometers employed are the Dumas and Regnault, which are used for the gas supplied; the Sugg, which is arranged for water gas; and the Weber, which is reserved for the examination of different gases and mixtures, and also for the measurement of the lighting power of incandescent mantles. The other room on the first floor is used for gas analysis, and is fitted with the Orsat and Bunte apparatus. The Junkers calorimeter is employed for testing for calorific power, and the Lux balance for the specific gravity of the gas. Sulphur is estimated with the Drehschmidt apparatus, naphthalene by Dr. Colman's method, and cyanides by the Feld process. There are also appliances for testing meters.

A PROSPEROUS CORNISH GAS COMPANY.

Interesting Features of Construction.

STARTING in 1865 with a capital of £2000, of which sum £1830 was subscribed on the first application, the Looe Gas and Coke Consumers' Company, Limited, made steady progress, and for upwards of forty years paid a dividend of 5 per cent. Since 1907, however, the growth of the Company has been phenomenal; and there are probably few gas undertakings in the United Kingdom which have grown proportionately to such an extent in the same period. In order to go with the times, the Directors three years ago increased the capital of the Company, which now stands at £6000 in ordinary shares and £3000 in debentures carrying 4 per cent. guaranteed interest. That this action was justified may be gathered from the fact that, whereas in 1907 the output of gas was 2,716,000 cubic feet, in 1908 it was 4,304,500 cubic feet, and last year 6,708,320 cubic feet; while at the present time the new works are



producing up to 8 millions. During the past two years, nearly eight miles of new mains have been laid. In 1907, there were 136 consumers, in 1908 there were 289, last year 404, and at the present time 450; and 300 cookers are in use. The revenue from the sale of gas in 1909 was £1237, compared with £576 two years previous.

The alterations and additions made to the works, involving an outlay of nearly £8000, have been in some respects quite unique from a gas engineer's point of view. For instance, two benches of generators by Messrs. Gibbons Bros., Limited, of Dudley, one containing five and the other six retorts, have their fires below the high-water level of the River Looe. But the most important feature is the erection of the new gasholder, raised 8 feet above the surrounding country. It is one of Messrs. R. & J. Dempster's; and the tank is built on a raised foundation of reinforced concrete over the tank of the former gasholder and meter-house. Considerable outlay has been saved by utilizing this part of the old works; for the tank, which has a capacity of 280 tons, will serve for the storage of ammoniacal liquor. As will be seen from the illustration, which is a reproduction of a photograph taken by Mr. E. Coath, of Looe, the new holder (of 50,000 cubic feet capacity) is on the Gadd and Mason system; and it rises 65 feet above the ground.

The other additions include a new shed capable of storing 1000 tons of coal near a siding from the adjoining railway, a new set of condensers, two new gas-engines, a couple of new exhausters, and a new Livesey washer and tower scrubber by Messrs. George Waller and Son, of Stroud, and new purifiers by Messrs. Clayton, Son, and Co., of Leeds. The Company's land extends a quarter-of-a-mile along the River Looe; and a charming residence has been built for the Manager, Mr. John Alderman, jun., who is only twenty-one years of age, and is probably the youngest gas manager in the United Kingdom. Having served his apprenticeship with the former Manager, he has shown the greatest aptitude, and throughout the extensions has had the entire confidence of the Directors.

Mr. R. A. Peter is the Chairman of the Company, and Mr. Wesley Martin the Managing-Director. He has personally superintended the extensions, and is to be congratulated on their completion in so satisfactory a manner, and with a minimum of inconvenience to the Company's customers and the general public. The whole of the masonry has been done by Mr. John Alderman, the father of the Manager.

TURBINE FOR THE CONTINUOUS TREATMENT OF SULPHATE.

By M. BROMHAM, of Brussels.

[A Paper read before the Société Technique du Gaz.]

IN treating sulphate of ammonia in a turbine of the vertical axis type, working intermittently, it is necessary to drain the sulphate first, otherwise the mother liquor and the salt find their way into the mechanism, which in this type of machine is placed in the lower part. Previous draining of the sulphate thus means double labour; and if the salt is drained for too long a time, it cakes on the table, and has then to be broken up with the pick in order to charge the turbine. Then, again, the sulphate being cold, it is less friable, and does not "turbine" so well; the product being one which the buyer has to break up fine before he can distribute it on the land in the most effective condition. The buyer will always prefer sulphate in a fine state, free from lumps and regular in tint. In the case of the turbine of the vertical-axis type, the removal of the salt gives some trouble, especially in the summer, when the sulphate is "turbined" warm. Finally, the constant interruption of the action of the turbine when it is charging and removing the product causes loss of time and motive power; the turbine not doing its full duty until it has attained its maximum speed.

These facts led the author to improve the process, with the object of producing sulphate of better quality and richer in nitrogen, reducing the cost of maintenance, manual labour, and motive power, and relieving the workman of the heavy operations which the process entails. In the method which has been devised, the turbine is built with its axis horizontal; the drum moving in a vertical plane. It turns in a crank-case lined on the inside with lead. The bearings are outside the crank-case, and consequently can be inspected while the turbine is running. They can also be looked at when it is not at work, without dismounting the turbine. The chief advantages of this apparatus over the type of turbine in which the axis is vertical are that the machine is kept constantly running; the charging with sulphate and the removal of the product being done without a stop. The system allows of the sulphate being introduced as a liquor almost as it comes from the saturator; all manual labour and draining being thus dispensed with. The mechanism is not liable to derangement from this practice, as the drum makes a tight joint with the sides of the chamber.

Introduced warm into the turbine, the salt dries much more quickly, and the product which emerges is of better appearance and is in a homegeneous state, free from lumps. The dryness is indicated by the figures for the percentage of water, which are 0·80 to 1. The nitrogen reaches 20·5 to 20·7 per cent., and even more; whereas with other systems of turbines, employed in the ordinary way, the nitrogen will not exceed 20·2 per cent. The high efficiency of the apparatus under consideration arises from the fact of the introduction of the sulphate into the drum while the latter is in motion; so that the sulphate is subjected to the maximum centrifugal force from the first moment of its treatment. The minimum of mother liquor is retained, the sulphate does not cake together on storage, and the sacks containing it do not deteriorate. A further advantage is the fact that the horizontal axis may be driven from an ordinary motor, from a steam or a gas engine, or even from a belt. Moreover, in consequence of the charging of the turbine while it is in action, the machine remains in equilibrium. The charge is removed from the apparatus by means of an extractor controlled by an outside screw; and the

operation requires from two to three minutes, according to the power of the machine.

In adopting the new system of turbine in conjunction with existing installations in sulphate works, the arrangements may be modified with advantage. If the saturator is of the continuous type, entirely closed, the salt is transferred to the turbine by means of a cock fixed on the conical bottom of the saturator. If the latter is of the usual rectangular type, open above, a special cock is affixed to the inclined floor of the apparatus, and the salt then flows into the turbine without the necessity of handling it at all. It should be stated that the turbine gives the same results when used in conjunction with an existing installation where the sulphate is removed from the saturators by hand. The turbine may also be employed in the gas-works themselves in treating anthracene and naphthalene, for which purpose it effects considerable economy and gives a better product.

ILLUMINATION OF INTERIORS.

Artificial Illumination by Gas and Electricity.

In the "JOURNAL" for the 21st ult., we noticed the first of the series of three special lectures on "Illumination of Interiors" arranged to be delivered by Professors Morris and Smith at the East London College, Mile End Road. The second lecture was given by Professor Morris; his subject being "Artificial Illumination by Gas and Electricity."

At the close of the first lecture, Professor Morris described Mr. Trotter's daylight photometer; and he opened the second by giving the results of further experiments with it. The diaphragm used was of such a size that the ratio of the area of the hole to the area of the hemisphere was 0·003. Measurements were made, in failing light, from the roof of the College, with the hood alternately in position and removed; and the mean ratio of the reducing factor of the diaphragm came out as about 0·015, or five times as great as the ratio of diaphragm area to the area of the circumscribing hemisphere. As a check, the lecturer tried balancing an arc light against daylight by means of a bunsen photometer; and he obtained values bearing out the measurements made with the Trotter instrument when using a ratio five times as great as that given by the makers.

Proceeding to the subject of his lecture, Professor Morris reminded his audience that the chief methods of utilizing coal gas as an illuminant are flat-flame burners and incandescent mantles—the latter working at both low and high pressure. The flat-flame burners were, he said, well on the way to becoming extinct; but the others were undoubtedly a highly-efficient means of illumination. A number of experiments on a Keith high-pressure burner were carried out at the College about two years ago. While improvements had been made since then in the durability of the mantles, the results already published could still be taken as standard ones, obtained under strictly scientific conditions so far as regarded illuminating efficiency. There was one point, however, and that was the relation between the efficiency of gas illumination and the calorific value of the gas employed. If they took an electric lamp, and used it first in one place and then in another, they would get absolutely identical results, both as to light and consumption of current, providing the voltage applied to the terminals was the same. This, however, was by no means the case with gas. In the tests just referred to, a high-pressure lamp was tested first at the College and afterwards in North London; and the illuminating power was 425 and 680 respectively—the variation being due to the different gas used. Seeing that practically all coal gas was now used for its calorific value, it seemed to the lecturer it was only fair that the consumer should be charged on this basis. In his opinion, the now obsolete "illuminating power of the gas," as specified by the Board of Trade, should be discarded, for a heat basis.

Turning to electric lamps, Professor Morris gave the following list of them, with figures showing their efficiency:—

Type of Lamp.	Watts per Candle Power.	Candle Power per Watt.
Carbon	3·50	0·29
Tantalum	1·90	0·53
Tungsten	1·30	0·77
Helion	1·10	0·90
Arc (open)	1·00	1·00
Flame arc (globe off)	0·25	3·80
,, ,, (globe on)	0·40	2·50

He said the table showed the great increase in efficiency obtained by the use of metallic filament lamps, and the considerable loss brought about by the globe which was necessary with such lamps as flame arcs. A lamp which really fulfilled the conditions for proper illumination laid down in the first lecture—*i.e.*, that in which the source of light is entirely shielded from the eye—was to be found in the inverted arc lamp; but it was particularly necessary that the ceiling above the lamp should be perfectly white. When used in workshops, it was desirable to place light boarding above the lamp, and to see that this reflecting screen was whitewashed fairly frequently. A lamp which called for notice at the present time was the Moore vacuum tube lamp, which had not the dazzling effect met with in other sources of light. There was probably less eye-strain in looking at these tubes when in operation than in looking out of a window. The great disadvantage attending this or any similar system was the liability to the accidental breaking of the tubes.

The lecturer next dealt with the quality of light; remarking that some lights are often spoken about as being "dazzling" while others are referred to as "soft." He pointed out that the chief determining factor in this matter is the intrinsic brilliancy or the candle power per unit area of the source. He gave the following figures to show the comparison between various light sources on this basis:—

	Candle Power per Square Centimetre.
Sun	100,000
Arc lamp	16,000
Tungsten lamp	150
Tantalum lamp	67
High-pressure incandescent gas	25
Carbon filament lamp	16
Flame arc lamp (10-inch globe)	3
Low-pressure incandescent gas	3
Flat-flame gas	1
Kerosene lamp	0·5

If a lighted tungsten lamp were looked at for a short time, when the observer turned away he could still see a kind of image of the filament in the field of vision. Any light which caused this should be provided with a shade. Probably all light-sources having an intrinsic brilliancy exceeding about 10 to 20 candle power per square centimetre, come under this category. On this basis, the high-pressure gas-lamp was better than the metallic filament lamp; though probably even carbon filament lamps should be provided with an efficient shade. Up to the present, it had been the practice of gas engineers to have high-pressure gas-lamps, when used for street illumination, with clear glass lanterns. The lecturer expressed the opinion that this should not be so, but that slightly frosted glass or similar protection from the direct rays should be employed.

Passing on to deal with the next consideration for efficient illumination—*i.e.*, fluctuation—the lecturer remarked that anyone who had had to read by the light given by electricity generated by a badly governed water-wheel, internal combustion engine, or other prime-mover of which the speed varied to any appreciable extent, would have noticed how very annoying the changes of light became. When either a flame arc or a gas-lamp happened to be out of order, violent fluctuations in light took place which might possibly be amusing under certain circumstances, but were decidedly unpleasant for those who wished to use the light.

After some remarks on the fluctuations of light on electric railways and tramways, the lecturer came to the question of shades for lamps. He said it was an interesting problem as to whether, for interior illumination, it was preferable to have a good local illumination at points where it was required for reading or writing, and more or less allow the general illumination to look after itself, or whether sufficient general illumination should be provided for all purposes. At one time he held the former view; but more recently he had inclined towards the idea that a combination of the two is the most desirable.

For street lighting, he for a long time (in opposition to general practice), insisted that shades should be provided, so that no horizontal rays might strike the eye when looking down the street. It would seem, however, that people preferred to see the effect of a number of bright points, rather than have a good illumination only on the ground. As an example, one might take the case of Whitehall. The high-pressure gas-lighting in this street was magnificent from the point of view of brilliancy, but certainly defective according to the view expressed above. For an efficient and scientific shade, it was necessary that, while the light should be deflected in the required direction, there should be as little loss as possible due to absorption. Such a series of shades or globes was that manufactured by the Holophane Company. The lecturer described these shades, and called attention to the remarkable extent to which polar curves of illumination intensity could be varied by them to suit the circumstances required.

In drawing his lecture to a close, Professor Morris said that a common fallacy existed that when the light of a room illuminated by (say) an arc lamp was deficient, it could be improved by lowering the lamp. But he produced diagrams which showed that while the illumination directly below the lamp was greatly increased, even to an undesirable extent, that at places some distance away was actually reduced.

Gas Companies' Accounts for 1909.—We have received from Messrs. John Allan and Co. the "'Gas World' Analyses of Gas Companies' Accounts for 1909." The accounts of 53 gas companies are analyzed, and the results set out on two large linen-backed sheets. On the left-hand one will be found particulars relating to the coal carbonized, the percentage of carburetted water gas produced, the quantity of gas made, sold, and unaccounted for, the yield of residuals, statistics of revenue, &c.; while on the right-hand sheet are given the distribution and management charges, bad debts, net cost of gas, mileage of mains, number of consumers and public lamps, total capital and the capital per ton and per 1000 cubic feet, and the reserve funds. As in the case of the "Analyses of Municipal Gas Accounts" issued early in the year, cardboard rules are supplied to facilitate comparison with figures of any of the undertakings given. The work is similar in appearance to its predecessors, and the price is 10s. 6d. net.

LIGHT-ECONOMIZING REFLECTORS FOR STREET-LAMPS.

This was the subject of a paper submitted to the Société Technique du Gaz en France by M. Grebel. He, however, did not read it, but gave an indication of its contents with the aid of diagrams on a blackboard.

In referring to the greater attention paid of late years to the figures for mean spherical intensity as a measure of the illuminating power of a light, the author gave diagrams of the curves representing this intensity in the cases of electric arc and filament lamps with and without globes, and of flat-flame and incandescent gas-burners—upright, inverted, and high-power. He proceeded to take the view M. Maréchal expressed in the latter's "L'Eclairage à Paris" (1894), that the ideal in street lighting is to provide uniform illumination of the ground. In investigating the conditions of such lighting in a simple mathematical manner, it is necessary to disregard certain factors in the cases; and the theoretical conclusions reached can only be taken as approximate. M. Maréchal, in the work just quoted, as well as in "Le Génie Civil" for Jan. 11, 1896, developed a method by which, from the characteristic photometric curve of a source of light, the illumination on the ground could be deduced, and *vice versâ*.

It can be seen that even in the case of illumination at very short distances, but particularly at the greater and more usual distances, the source of light should give its maximum effect well above the 45° line; the variations in intensity being different from those of any existing lighting systems. In particular, the ray of maximum intensity with the unscreened electric arc, the photometric curve of which comes, as a rule, nearer to that of uniformly diminishing illumination on the ground, has not risen to any appreciable extent towards the horizontal passing through its source.

All known lamps and burners give, on the ground, illuminations in decreasing series which can be mapped out into concentric circular zones. In the case of a single light source, the isolux curves (of equal illumination) are practically circles; the framework or forked standards of the light only interfering with this distribution of the light. In the case of a street where the light sources A B C, arranged alternately on the two sides of the roadway, as shown in the accompanying diagram, form a diamond-shape pattern, the curves of equal illumination are circles which are distorted in consequence of the proximity of the other sources.

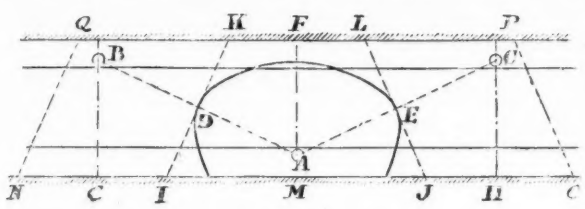


Fig. 1.

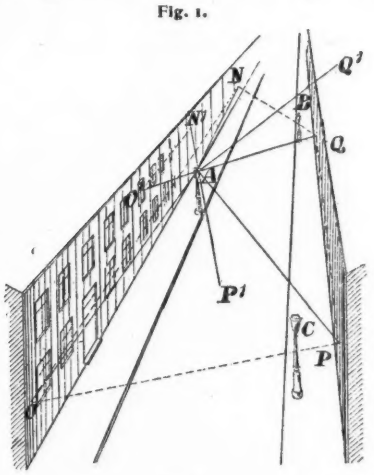


Fig. 2.

There are thus points D E F G H of minor illumination and I J K L of minimum illumination. In order to produce uniform illumination over the whole area of the street by means of light sources having photometric curves of even illumination, it would be necessary that the area illuminated by a source A should be limited exactly either to the area I J K L or to the rectangle formed by the lines B G and C H, if adjacent lights are to overlap by halves. The distribution of the light should vary with the azimuth. On the first hypothesis—a luminous flux—the light emitted should be greater in the directions A I, A J, A K, A L, than in the direction A F, A D, A E, and particularly A M.

If the light sources are taken as giving characteristic curves of evenly decreasing illumination which is more nearly in accordance with practice, for the light source A the illuminated area will be limited to a figure which, for the sake of simplicity, we will assume to be a trapezium N O P Q. The luminous flux would then be prolonged into the directions A N, A O, A P, and A Q, contracted along A F, intensified along the lines A L, A K, A I, and A J, and both contracted and reduced in the direction A M.

Coming to the subject of reflectors and prisms, the author pointed out that of the methods adopted for the correct natural distribution of light, the diffusing globes of Frédureau and the reflectors (sometimes combined with prisms) of Habrowski deserve to be named among the most notable attempts in this direction. With these, the same distribution of light is obtained whatever is the meridian plane considered. The author's aim, however, has been to produce a distribution varying with the azimuth, and with the various purposes of the lamps. The reflectors of lamps used in street lighting cut down the solid angle of the illumination. This applies to incandescent gas or electric lamps provided with a reflector, as well as to arcs or high-power incandescent burners fitted with a globe and an outside shade or reflector. In the case of the square street-lamps, the solid angle is a very open quadrihedral (A O^1 N^1 P^1 Q^1) and is more often cut down by the supporting framework than by the edges of the reflectors. The form which the reflectors should have has not been thoroughly studied. Regard has most often been paid to ease of manufacture and of fitting to the lamps, &c. As M. Lévy has pointed out in his "Eclairage à Incandescence par le Gaz" (1905), "the chief consideration in public lighting is to give as strong an illumination as possible on the ground," without causing, in the neighbourhood of the burners, patches of extra brilliancy separated from each other by dark areas. A good reflector should be devised so as to use the light in the best way, and remove the reflected rays as far as possible from the burners. This latter condition rules out all simply concave or conical burners which give bundles of rays ranging from parallelism to divergence.

In devising a series of reflectors, the author has therefore kept before him the double task of economizing the light by reducing the solid angle of illumination and of distributing the light in a manner varying with the inclinations and with the azimuths, and affording, as far as possible, an illumination uniformly diminishing in the various meridians.

In the case of the diamond-pattern arrangement of street-lamps shown in the diagram, where reflectors of parabolic section are fitted to incandescent gas or electric lights, the rays of light will be intensified in the directions A L, A K, at the expense of those in the direction A M. The flow of light will thus be concentrated in the directions A K, A L, A I, A J. The forms of the reflectors will vary with the particular light sources employed. They are prepared on theoretical lines, and are corrected by practical trial. In order not to multiply patterns, they will be of forms capable of being utilized within fairly wide limits. Moreover, the reflector can be mounted upon an upright standard attached to the lamp, so that it can be used at a greater or less height above the source of light. Special forms of the reflector will be required—for example, in the case of light sources placed in the centre of the roadway or in the angles formed by sharp turns of the road. A reasonable estimate of the light which is saved by this system of reflectors is one-third or one-fourth—that is to say, the production of a given light with 90 litres (3·18 cubic feet) of gas per hour instead of with 112 litres (4 cubic feet) in the case of a 120-litre (4·23 cubic feet) burner. The author expressed the hope that he would be able to give next year some results of practical trials of his system.

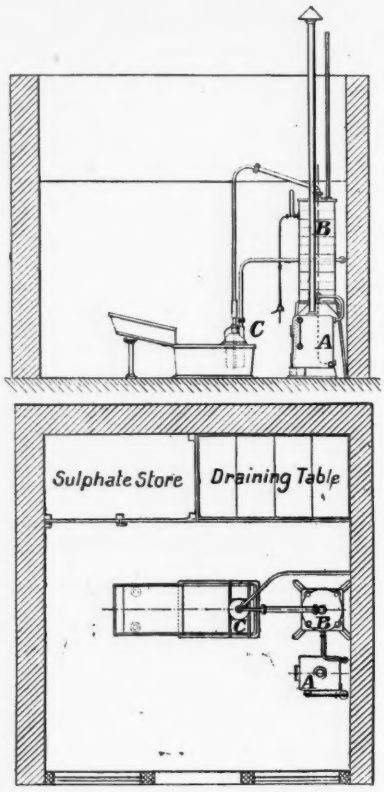
TREATING AMMONIACAL LIQUOR IN SMALL GAS-WORKS.

By M. Ferdinand Chevalet.

[Abstract of a Paper Read before the Société Technique du Gaz.]

In small gas-works, managers are now almost compelled to deal with their ammoniacal liquor. It cannot be allowed to escape, and if it is sold in its crude state, it has to be stored for the greater part of the year, as the time for selling it is the autumn. The small maker has consequently to produce either sulphate of ammonia or a concentrated liquor, in doing which attempts have frequently been made to use an installation of the kind employed on the large scale. This, as a rule, means the full time of a workman, whose wages practically amount to the price of the manufactured product. Constant attention is needed for the small boiler, in the matter of fuel and water; and such an installation, besides producing disturbing variations of pressure, requires a good deal of supervision in the way of cleaning the boiler and keeping it free from scale. With the object of dispensing with both the steam-boiler and its attendant, the author constructed in 1878 sulphate plant heated by thermo-syphon tubes placed in the flues of the furnaces, or, better still, in a special flue along which some of the hot gases were caused to pass. The liquor was distilled in a series of boilers working at only atmospheric pressure; the distilled vapours reaching the sulphuric acid *vid* a leaden bell, from which the objectionable gases passed off. The apparatus is described in M. Vincent's work, "Industrie de Produits Ammoniacaux," published in Paris in 1884, though the method has recently been brought out as novel. The apparatus has answered well for many years in different works; but there are difficulties

in controlling the heat, in consequence of the over-heating of the furnaces, thus leading either to incomplete treatment of the liquor or to dilution of the acid baths according to the presence of too little or too much steam. The *crux* of their proper action is the amount of supervision available. To avoid the steam-boiler, the author installed in several works distilling about 300 tons of coal sulphate plant of another type. It consists of a still of column form; the liquor entering at the upper part. The residual liquid finds its outlet at the base of the still, whence it passes to a boiler heated by an open fire. The boiler is similar to one used for generating steam in the ordinary way; but the feed is constant, and no supply pump or injector is necessary. It also works at the ordinary pressure. Hence the services of an attendant are not absolutely necessary. By using a large grating, so as to be able to burn a mixture of coke and slack in the furnace, an almost regular supply of steam is obtained. With the object of further reducing supervision and manual labour, an apparatus was designed in 1902 very similar to the one just mentioned, but with the heat obtained from a furnace formed by a kind of Siemens generator of very small size, which was charged with coke about every three hours. This answered all the expectations, and the workman had only to fish out the sulphate and look after the furnace. Yet here again there was a drawback of the irregular supply of steam.



The Chevalet Sulphate Plant.

Further study led to the production of a type of plant which is practically automatic. At any rate, when once adjusted, the only thing the workman has to do is to keep in it a sufficient supply of fuel. It will be seen from the accompanying illustration that it consists of a distilling column B, provided with constant feed, supplied with steam from a boiler A, furnished with a hopper for the fuel. The boiler is fed by the exhausted liquor from the still. The flow of liquor is regulated by the tap C. An automatic syphon draws off this exhausted liquor to the boiler, while the steam enters at the lower part of the distilling column. The air supply of the furnace, and therefore the production of the steam, is controlled by a temperature regulater, which forms the essential part of the apparatus, and is protected by patent. The products of distillation are collected either in a sulphuric acid bath or in an upright washer. The form of the installation and its constant action do not admit of the use of lime for decomposition of the fixed ammonia. About 10 per cent. of the ammonia is thus lost; but the plant gains in simplicity or construction.

In the practical use of the apparatus for the production of sulphate of ammonia and concentrated liquor, it has been found that for the former the installation can be left entirely to itself, except the filling of the coke-hopper every four hours. This is done without touching any of the cocks of the apparatus, and on the night shift may be entrusted to one of the men. Distillation can, however, be suspended during the night-time without prejudice to the saturation of the bath on resuming work in the morning. The removal of the sulphate to the drainer requires a couple of hours' work; but except for this, and the replenishment of the fuel, no manual labour whatever is needed. For fuel, the boiler uses No. 1 coke—2 bushels per 220 gallons of the liquor treated. As to whether sulphate or strong liquor should be made, will depend, of course, on the market price of sulphate, sulphuric acid, and liquor. As a rule, it is more advisable to manufacture sulphate.

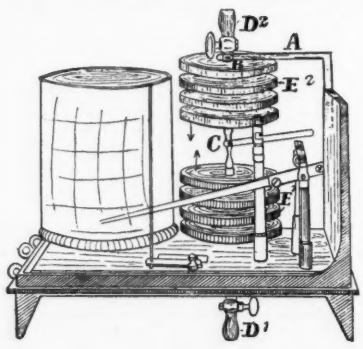
In conclusion, it may be said that most of the complaints in regard to the treatment of ammoniacal liquor arise from the use of defective plant procured by sparing expense in the first instance. The author would get rid of all vessels with soldered joints, and replace them by those with hammered joints. The former are constantly developing leaks and entailing costly repairs; while, owing to the variations in temperature, their life is short. With proper apparatus, it is possible, in works where 1000 tons of coal are carbonized per annum, and where the gas is well washed, to work up the ammoniacal liquor at a profit.

A NEW FORM OF PRESSURE-GAUGE.

One of the papers submitted at the recent Congress of the Société Technique du Gaz en France was on "A New Form of Pressure-Gauge." It was by M. Albert Largeron; but owing to his absence, it was not read.

The author began by remarking that information of a most useful kind being obtainable as to the operations of gas manufacture from a precise knowledge of the variations in pressure of the gas on its way from the retorts to the mains, simple means of automatically recording such variations should be of interest. As a rule, each piece of plant in gas-works is fitted with a pressure-gauge at both the inlet and the outlet. The differential pressure-gauge is a combination of these two instruments, since it gives the variation in pressure, and, by means of the cocks, which communicate with the atmosphere, also the absolute pressure, at any point. Such information obtained by observation is useful, so far as it goes; but it depends upon the watchfulness of attendants, and may, therefore, at times be neglected. Moreover, it is impossible to obtain in such a way a simultaneous record of pressure variations in all parts of the plant. The author, therefore, sought to provide the means of attaining this end; the apparatus described by him having the advantage of recording automatically actual pressure and changes in pressure. Only one instrument is needed on each apparatus or point where observations are to be made.

Inside a box of metal resembling a miniature purifier, a registering pressure-gauge is placed. The lid of the box is pierced with two holes, into which cocks are screwed. One of these connects the pressure-gauge with the inlet and the other with the outlet of the apparatus under examination. Thus arranged, the box receives two pressures—one being that of the inlet the other that of the outlet. The first tends to enlarge (excess of pressure), the second to contract. Thus the movement of the stylus is proportional to the difference of pressure—that is to say, to the change in the pressure of the gas in passing through the apparatus. This, of course, can be correct only when it is assumed that for pressures which are equal and in opposite directions the box performs oscillations of the same amplitude. In this way, records are obtained of changes taking place in pressure.



The value of these records led the author to convert the usual indicator into another equally simple in construction. The process consists in adding a second box in alignment with the first; the moving end being connected to the same point on the control lever of the stylus in such a way that the movements of the one are directly the opposite of those of the other. From the construction of the apparatus, it follows that for equal pressures in the two boxes the stylus will point to the zero mark. The same apparatus will register pressures; a cock being employed to connect one of the boxes with the atmosphere. As already noted, the equality of amplitude in the case of each box is the condition of correct indications.

Accompanying the paper was a record of a "Duplex" station meter of 1¾ million cubic feet capacity, showing the changes in pressure corresponding to different periods in the distillation. Another diagram showed the change of pressure in the first of a group of three scrubbers; and a third represented the working of three scrubbers over a period in which an obstruction occurred

in one of them—the diagram being obtained without checking the gas.

The accompanying illustration shows a Couttolenc apparatus converted into a register of changes in pressure by the addition of a second manometric box. A standard A supports the box in the fixed position B. The two boxes are joined at C by the extreme ends of their moving parts. The cocks D_1 and D_2 establish communication between either box and the apparatus under examination. The two boxes have a common vertical axis; and it will be seen that the effect of gravity upon the first is to reduce the amplitude of the oscillations of E_1 and, upon the second, to increase that of E_2. Under this condition, it would be better to make the common axis horizontal.

TROUBLES WITH PRODUCER-GAS ENGINES.

The following letter, which appeared in the "Mechanical World" for the 1st inst., will probably be perused with interest by many of our readers.

I suppose no prime mover ever invented has been more productive of impolite, and often lurid, terminology, than the gas-engine running on producer gas. Its vagaries and erratic behaviour worry the owner, and gradually produce "nervous prostration" in the attendants. I have four running continually (or endeavouring to) on Dowson gas; two of which were designed for town gas, and the others for either producer or town gas. The last mentioned give the most trouble. The ignition is by magneto; and the very infrequent trouble here is easily located. The generator plant has been operating some eight years, and supplies the engines through different mains from a large gas-holder. Various combinations of fuel (coke and anthracite) have been tried, scrubbers kept scrupulously clean, engine valves and cylinder heads overhauled and cleaned weekly—in fact, everything done that time and brains could suggest or money buy. But even this constant watching and attention still fails to dispel that "haunting fear" or premonition of receiving still another message from the power-house to the effect: "No. 2 started to back-fire" (or something equivalent). "Lost the load before No. 3 could take it over. Have examined valves, ignition, &c., but can find nothing wrong."

Papers have been read, text-books written, and many articles published in the Technical Press on producer gas and its applications; but no definite or exact rules, so far as I am aware, have been given enabling one rapidly to locate and remedy producer-gas troubles. The design of the engines may possibly be faulty; but this will not account for such engines taking spasmodic fits of "back-firing," especially after working well for a considerable time. Engine makers often ascribe the trouble to dust held in suspension in the gas; but on filtering through a bye-pass and cotton wool the filtrate (if any) will be found of a tarry nature, entirely different from dust.

My experience leads me to think that the gas varies very considerably in its composition, probably due to the manipulation of the generator and the "hit-or-miss" principle of balancing the proportions of fuel and steam. What I believe is really required is a "recording analyzer" (something like the "CO_2 Recorder"), giving a time record of the variations of the most important components of the gas. The mere burning of an open jet, and judging from the appearance of the flame, is of little or no value. Barometric influences (regarded by some as a cause of trouble) can be neglected, as they are balanced by regulation of the air-cock.

The Editor of our contemporary invited other contributions on the subject; but, so far, they have not been forthcoming.

NATURAL GAS AND PETROLEUM IN AMERICA.

The President of the Society of Chemical Industry—Mr. Ira Remsen, of the Johns Hopkins University, Baltimore (Ma.)—devoted a portion of his Inaugural Address at the annual meeting of the Society held in Glasgow last week, to the subject of natural gas and petroleum in America. He led up to it with some remarks on the present excessive use of coal and pointed out that more economical methods of combustion are loudly called for. He said one check on coal consumption was found in the use of other forms of energy for the production of heat; water being the chief factor. On the subject of coke production, he said there was a marked improvement in the direction of economy. There was an increasing demand for the bye-products—gas, tar, and ammonia. With regard to coal tar—that "magic substance, that Pandora's box"—this was of much less economic importance in America than in some European countries. Why this was so it was not easy to say, though no doubt the tariff and labour were important factors. At the present time, coal-tar manufacture in the United States was confined principally to the production of creosote and of tars and tar pitches suitable for making roofing papers, paving materials, &c.

Coming to the subject of natural gas and petroleum, the President said that Mr. I. C. White, an eminent geologist of West Virginia, one of the speakers at a conference of the Governors of the United States, scientific men, and others, held at the White House in May, 1908, dwelt especially on the waste of the country's fuel resources. He had for years been a daily witness of the great waste of natural gas, and expressed himself strongly on the subject. He said: "The record of waste of this best and purest fuel is a national disgrace." He then continued: At this very minute, our unrivalled fuel is passing into the air from uncontrolled gas wells, from oil wells, from giant flambeaus, from leaking pipelines, and the many other methods of waste, at the rate of not less than 1000 million cubic feet daily, and probably much more. The heating value of a billion cubic feet of natural gas is roughly equivalent to that of a million bushels of coal. What an appalling record to transmit to posterity." The President went on to remark that the rapidly extending use of natural gas is of importance as a check on coal consumption. The city of Baltimore, which has a population of about 600,000, is now engaged in negotiations which will probably lead to the introduction of natural gas from the oil-fields of West Virginia, about 200 miles distant. The gas can be furnished at a considerably lower price than water gas, which is now used for illumination and to some extent for heating. Several advantages it is thought will accrue from the introduction of natural gas. The illumination will be less costly, and the gas is a cheap fuel as compared with coal. The industries as well as households will, no doubt, make extensive use of it, and will find it profitable to do so. But, more than this, the substitution of natural gas for coal as a fuel will make Baltimore a cleaner city than it now is, though it has not suffered as much as many other well-known places from the curse of smoke.

Passing to the subject of petroleum, the President pointed out that there is now but little waste of it. There is, however, opportunity for waste in the process of refining; but this has been managed with such skill that only 1·5 per cent. is lost. When petroleum was first refined, kerosene was naturally the most important product—in fact, it was about the only product that was useful. After the kerosene was extracted from the crude oil, the rest was thrown away. To-day kerosene is relatively less important than formerly. It is hard to say which can be called the residual and which the principal products. There are at present nine products or classes of products obtained from petroleum. Their names are given in the subjoined table, together with the yield of each class in percentages, and the total production in the United States for 1909. This is stated in barrels with the exception of coke, the figures of which are tons.

Kind of Product.	Per Cent. Yield.		Production in 1909.
Kerosene	20·50	..	15,000,000
Lubricating oils of all kinds, including greases	10·00	..	7,500,000
Naphthas, all grades	15·00	..	11,250,000
Gas oil, used for enriching water gas	30·00	..	22,000,000
Paraffin wax	1·50	..	1,125,000
Roofing pitch	2·50	..	1,875,000
Paving pitch and road-making oils	2·00	..	1,500,000
Coke	3·00	..	300,000
Fuel oil	14·00	..	1,050,000
	98·50		
Loss in manufacturing	1·50	100	

In closing his remarks on this subject, the President dwelt on the fact that, in working out the problems of the petroleum industry, chemistry has played an important part. In addition to the general problems involved in refining, there is a special problem that was presented by the petroleum found in the neighbourhood of Lima (Ohio), and known as Lima oil. The deposits are very extensive; but for a long time it was impossible to use the oil on account of the presence in it of small quantities of sulphur compounds, which gave it a disagreeable odour not adapted to the uses of the household. Chemistry solved this problem, and made available immense quantities of petroleum that otherwise could not be used.

USE OF ALUMINIUM IN GAS-WORKS.

In a "note" presented to the meeting of the Société Technique du Gaz, M. Camille Roche points out that the price of aluminium having now fallen from 5 frs. to 2 frs. per kilo., the use which can be made of the metal in the gas industry becomes of considerable interest. Despite the difficulties which have been experienced in working it in the past, aluminium has been found of great utility in a number of trades; and a notable feature of importance with respect to its use in the gas industry is its immunity to vapours containing sulphur in any form (sulphurous acid, hydrogen sulphide, &c.), as well as the gases from purifiers and spent oxide, containing a greater or less proportion of cyanogen compounds. In like manner the metal is unaffected by ammonia and its compounds. The immunity which it enjoys to sulphur and ammonia vapours has permitted of use being made of it in place of copper for several purposes in the writer's experience. Copper electrical conductors of a diameter of 56-10 mm. formerly passed to the outside air above the retort-house doors. They were fixed about 6 metres in the air, and were thus exposed to all the sulphurous vapours arising from the quenching of the coke. Two years' exposure sufficed to corrode them completely; but on replacing the copper by aluminium, the necessity of renewing them has been obviated.

Again, the electric switch-board in the exhauster-house had its copper parts attacked by the ammonia and covered with a brown deposit. The contacts which could not be soldered to the board were thus affected, and heated unless they were constantly cleaned, while those of aluminium installed side by side with the copper do not give rise to the slightest trouble.

Compared with brass, aluminium exhibits a degree of resistance to the residual sulphur compounds in gas which confers a much longer life upon all vessels or fittings for which it is used. It may be employed, instead of brass or bronze, for many purposes with

great advantage. It can be brazed as readily as other metals, and takes quite a good polish; while taps, &c., work easily and form tight joints.

Aluminium tube, it should be stated, is made in all sizes and thicknesses. The diameters of from 6 to 15 mm., with thickness of wall from 12-10 to 15-10 mm., are suitable for gas-fittings, and are the same as those adopted for brass. Also all bronze foundries prepare very clean castings of aluminium, and the parts are turned with the same tools as for bronze. In brazing aluminium parts together, a certain discoloration is produced; and therefore fittings, &c., should be made up so that the brazed joints do not occur where they are prominent. The writer has had constructed a variety of gas-fittings, the cost of production of which in aluminium has been below that in brass, though larger tubes—15 mm. as against 10 mm.—were employed. These fittings are more rigid and have a better appearance; the pleasing colour of the aluminium obviating the cost of decoration. Added to these advantages is the fact already mentioned, of immunity to the products of combustion of the gas, which feature alone provides an inducement to adopt aluminium.

The metal has likewise been applied for the mountings of manometers in the works; the sulphur gases quickly causing the cocks of the brass instruments to stick. Substitution of the brass by aluminium has been followed by most satisfactory results, insomuch that aluminium cocks were also fitted to the Pelouze and Audouin apparatus and to the washers and purifiers. It would be interesting to try the metal for the drums of meters.

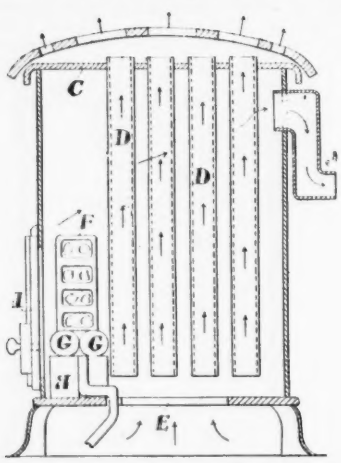
REGISTER OF PATENTS.

Apparatus for Heating Air.

CLOAKE, A. G., of Holborn Viaduct, E.C.

No. 654; July 10, 1909.

This arrangement for heating air by means of gas relates to that class of apparatus wherein a chamber, having in it a series of tubes through which the air to be warmed is passed, has a receptacle for the fuel arranged within it, so that the products of combustion of the fuel are caused to pass over the tubes, and are then led to a chimney or flue, so that they do not mix with the air being warmed.



Cloake's Gas-Stove.

In the vertical central section shown of the apparatus, the sheet-iron or cast-iron body is at the lower end supported upon a base-plate, while at the upper end it carries a plate C, in which a series of air-tubes D are fixed; so that the air which enters through an opening E in the base-plate will pass upwards through the tubes D and enter the compartment to be warmed. F is a basket adapted to contain the lumps of asbestos or other material to be rendered incandescent; the basket being carried upon a stand G and being arranged in conjunction with a pipe H, through which a mixture of gas and air is passed for the purpose of heating the material in the basket. I is the door adjacent to the basket, and provided with transparent panels. The products of combustion pass in the direction of the arrows to a flue pipe J arranged in the body of the stove.

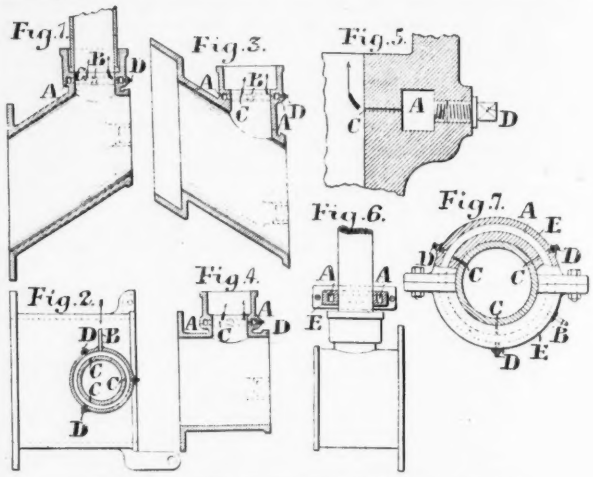
Mouthpieces or Ascension Pipes of Gas-Retorts.

FARQUHAR, W. B., of Ilford, Essex.

No. 13,982; June 15, 1909.

This invention has for its object to provide "more convenient and efficient means than heretofore for introducing steam into the ascension pipes of gas-retorts in order to keep them moist, and thus prevent them from getting stopped up by deposits."

Previously, as the patentee points out, it has been proposed to force water or steam into the mouthpiece or ascension pipe, through suitable pipes passing through the mouthpiece or ascension pipe—the pipes in some cases being provided with removable plugs to permit of a wire being inserted into the pipes to clean them. According to the present proposal, the steam, before passing into the branch-pipe or ascension-pipe, first passes into an annular channel cast in one with the branch pipe, or the annular channel is fixed to the branch or ascension pipe; the channel being provided with radial perforations through which the steam passes.



Farquhar's Retort Mouthpieces and Ascension Pipes.

Fig. 1 is a sectional side elevation of an inclined retort mouthpiece with the invention applied to the ascension pipe socket in same. Fig. 2 is a sectional plan of fig. 1. Fig. 3 is a sectional side elevation of another form of inclined retort mouthpiece. Fig. 4 is a sectional side elevation of a horizontal retort mouthpiece. Fig. 5 is a sectional elevation of part of the socket (on a larger scale). Fig. 6 is a side elevation of a horizontal retort mouthpiece and ascension pipe. Fig. 7 is a part sectional plan of fig. 6 (on a larger scale).

In figs. 1 to 5, the socket is cast with an enclosed annular channel A round the base of it, forming an annular steam passage all round the bottom of the socket and connected by the pipe B to a suitable steam supply. Passing transversely through the channel A, there are (preferably three) radial or tangential holes of suitable size (say ⅛ inch more or less) through the outside wall of the channel, and then drilled at C to a much smaller diameter through the inner wall of the branch pipe at the base of the socket. The holes in the outer wall are plugged with removable screwed plugs D; and through the holes in the inner wall the steam issues from the annular space A as fine jets into and up the ascension pipes, thereby keeping them moist. In case the jet holes C should get stopped up, they are easily cleaned by first removing the corresponding plug D from the hole in the outer wall of the channel A and inserting a pricker.

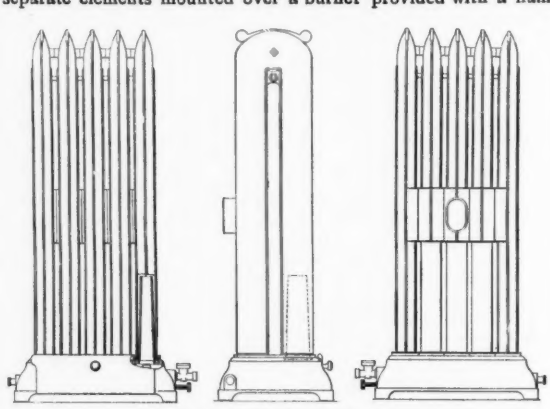
Instead of the annular channel A being cast in a piece with the socket of the branch of the mouthpiece, the channel is formed as a separate annular pipe embracing the ascension or rising pipe, or embracing the branch pipe on the mouthpiece at the base of the socket (which branch pipe would then be made longer than shown) and furnished with a steam connection for the steam supply, and also having small nipples, holes, or branches which correspond with the steam-jet holes C in the ascension or rising pipe, or in the branch pipe at the bottom of the socket to form the steam-jet. An example of this modification is illustrated in figs. 6 and 7, where the ascension or rising pipe is enclosed by the annular steam-pipe E made in halves to fit round the pipe—the halves being bolted together. In the outer wall of the pipe holes are tapped, fitted with screwed plugs D, and in the inner wall there are the smaller steam-jet holes, which are, as shown in fig. 7, continued through the pipe; so that the steam-jets will pass from the steam space A in the pipe E into and up the interior of the rising pipe.

Gas-Heated Radiators.

YATES, H. J. (John Wright and Co.), of Birmingham.

No. 20,828; Sept. 11, 1909.

This invention, relating to gas-heated radiators of the non-condensing type, comprises the employment, at the rear of a number of independent or separate elements mounted over a burner provided with a flame-



Yates's Gas-Heated Radiator.

orifice beneath each element, of a discharge box or chamber with which all the elements communicate, and from which the burnt gases are withdrawn by a flue-pipe or other conduit.

Each element (except the two end elements) is produced in the form of an inverted U-shaped tube of oval or other section, and having the rear member about one-half the length of the front member—the rear members of the end elements being continued to the same length as the front members. Each extremity of the short or rear members of the elements is adapted to form a section of a box or chamber; and the end elements are provided at corresponding positions with hollow lateral extensions or projections; so that, when all the elements are assembled in the usual order, the box sections and projections come together and form a complete box or chamber at the rear side of the apparatus. In conjunction with one of the box-sections is formed a branch, to which an ordinary flue-pipe is attached. All the elements are mounted on a base, beneath which is a burner with an outlet or flame orifice opposite each front member of the elements; while adjacent to the burner are suitable gas and air regulating devices.

The illustration shows the construction in front elevation, side elevation, and rear elevation of a five-element radiator constructed in accordance with the invention.

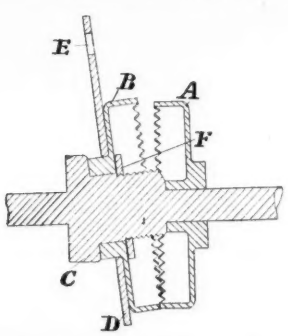
Stop-Mechanism for Prepayment Gas-Meters.

MILNE, J., and ALEXANDER, W., of Edinburgh.

No. 20,952; Sept. 14, 1909.

This invention relates to meters in which the valve controlling the supply of gas is opened by the coin-operated mechanism and closed (after a predetermined consumption) by means of gearing connected to the ordinary meter-registering mechanism. The operation is effected by a pair of crown-wheels having a different number of teeth, but always in gear at one part of their periphery.

One (A) of the pair of crown-wheels is fixed to the gearing connected with the meter-registering mechanism, so that it cannot be rotated except by the working of the meter. The other crown-wheel B is carried loosely by a nut or washer F, against the bevelled collar C, which is connected to, and rotated by the operation of, the coin mechanism—the two crown-wheels being always in gear at one part of their periphery. To the wheel B is fixed a disc D, on the periphery of which is a slot E, in which the valve spindle is carried. The slot is so disposed that a partial revolution of the crown-wheel on which the disc is mounted causes the valve-spindle to be moved forward or backward—thus opening or closing the valve controlling the supply of gas to the meter.



Milne and Alexander's Stop-Mechanism for Prepayment Meters.

After the insertion of a coin, the bevelled collar C is caused to make a complete revolution. This rotation of the bevelled collar against the boss of the wheel B imparts to the latter an oscillating movement; and, furthermore, in consequence of this wheel containing a different number of teeth to that of the wheel A, into which it gears (the latter being held stationary owing to its being in connection with the gearing of the meter-registering mechanism), the oscillating wheel B is given a rotary movement. This movement is proportional to the difference between the number of teeth of the two crown-wheels, and is either in one direction or the reverse, according as the number of teeth in the wheel B is greater or less than the teeth of the wheel A into which it gears. This partial rotation of the wheel B, and the slotted disc D which it carries, causes the valve to be opened so as to pass gas to the meter. The working of the meter imparts rotary motion to the wheel A carried by the gearing attached to the meter-registering mechanism; and as this wheel is always in gear with the oscillating wheel B, it causes the latter to revolve with it. As, however, the movement thus given to the wheel B and disc D is arranged to be opposite in direction to that imparted by the operation of the coin mechanism, the valve is closed after a predetermined quantity of gas has been passed through the meter—a quantity regulated by gearing interposed between the meter-registering mechanism and the driven crown-wheel A.

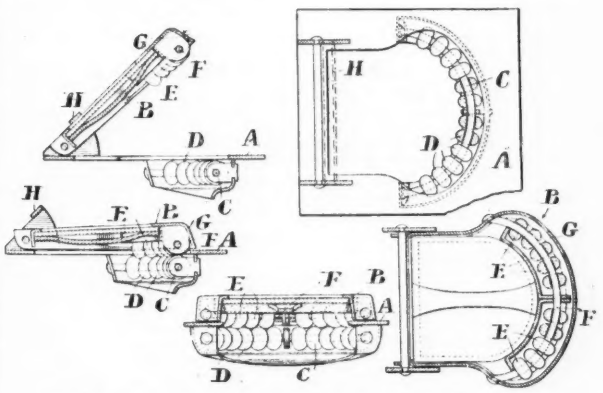
Torch Traps for Street Lamps.

PARKINSON AND W. & B. COWAN, LIMITED, and CHESHIRE, W., of Birmingham.

No. 23,299; Oct. 12, 1909.

This invention relates to the hinged traps or flaps of street and analogous lamps—more particularly that type in which anti-friction devices are carried by the front edge of the hinged flap member or trap proper and also by the corresponding edge of the torch opening or aperture in the carrier or base frame to which the flap is hinged, so as to facilitate the insertion of the torch and prevent damage to it.

The trap comprises a horizontal foundation plate or base frame A (forming part of the bottom of the lamp), provided with a central aperture through which the torch is inserted, and to one side of which the trap or flap member B is hinged. Below the front edge of this central aperture a semi-circular or curved wire rod C is carried, upon which a



Parkinson and Cowan and Cheshire's Street Lamp Torch Trap.

number of balls or rollers D are loosely strung or threaded. The ends of the wire carrier rod are threaded through, and supported by, a pair of lugs or brackets at the opposite ends of the guard casing, and is further supported at about its middle by a third lug or ear suitably attached to the frame. The front edge of the hinged trap B is similarly provided with a series of balls E loosely threaded upon a curved wire carrier rod F, the opposite extremities of which are threaded through, and supported by, the ends of an overhanging or hollow front part G, and also supported at its middle by lugs. When the trap is closed, the anti-friction balls E thereon fit within the inner circumference of the ring of balls D on the frame, and lie close up to them.

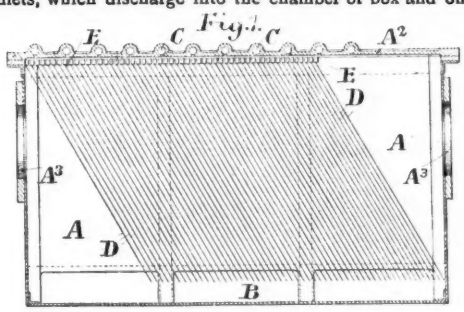
The trap automatically falls by gravity and closes the aperture when the torch is withdrawn from the lamp. To prevent the trap being thrown too far back when the lighting torch is introduced into the lamp, a stop H is provided.

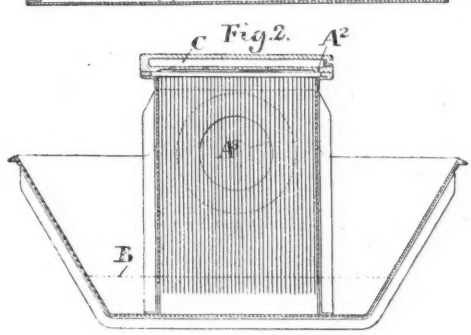
Separating Tar from Combustible Gases.

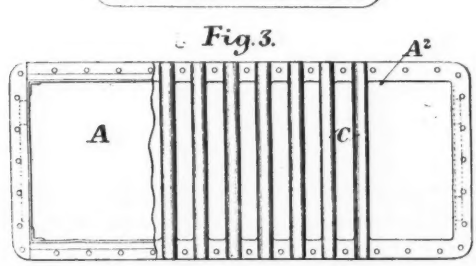
BURSTALL, F. W., of Birmingham.

No. 24,261; Oct. 22, 1909.

Within a gas-tight chamber or box through which the gas to be operated upon travels, either by a slight suction or pressure, the patentee provides numerous vibrating or quivering wires, or wire-like lengths, each of which has one end free or unsupported; and he arranges, in connection with the wires, a number of water, steam, or other inlets, which discharge into the chamber or box and on to the







Burstall's Tar Extractor.

wires at an angle to the wires, so that the combined actions of the gas treated flowing through the chamber and the spraying water set up a continuous vibrating or quivering effect of the wires, through which the gases to be treated must pass during their passage through the chamber.

A "desirable form" of the invention for extracting tar from combustible gas is represented, on p. 121, by a longitudinal section (fig. 1), a transverse section (fig. 2), and a partial plan (fig. 3).

The chamber A is a stationary one enclosing a good space, and is provided with a removable lid A^2, gas inlet and outlet A^3, and a water-sealed bottom B; it being otherwise entirely a gas-tight structure, maintained also in this respect by the lid and the inlet and outlet branches. In connection with the lid are provided a number of water-passages C, through which numerous small openings communicate with the interior of the chamber in such manner that the water is sprayed into the interior. Longitudinally of the chamber the wires D are numerous, and extend at small distances apart right across the interior of the structure, with their one ends E fixed, and their other ends free. As all the wire lengths are between the inlet and outlet, and extend almost the full depth of the interior of the chamber, the gas passing through must be broken up and made to flow in a circuitous manner through the greater part of the whole of the wires, "particularly having regard to the fact that the chamber is much larger in depth and width than the inlet and outlet, which is desirable, and compels the expansion of the gas within the interior of the apparatus." Each of the wires is able to vibrate or quiver independently; and it is not intended that they should touch at any time. It will be seen that the water inlets are arranged at an angle to the wires.

In action, it is believed that the wires vibrate or quiver within a dense water vapour or atmosphere provided by the liquid, and that the tar in suspension clings to the wires and gradually trickles downwards off their free ends into the bottom of the chamber, where it can be removed; the vibrating or quivering of the wires being effected by the combined actions of the gas passing through the box and the water spraying on to the wires.

The water seal at the bottom of the chamber is sufficient to prevent any gas finding its way through; and it is intended to provide so that the same water may be used over and over again by pumping the surplus of the seal into a pressure tank or pump supply suitably situated and connected up to the passages C, which preferably have their inlets alternately placed on different sides.

It is preferable, the patentee points out, to rigidly connect a number of wires at their one ends to a bar E, whose length extends transverse of the chamber, as shown in fig. 2. This bar is narrow, as shown in fig. 1, and is fixed rigid between the top of the body of the chamber and the lid. The bar carries a single row of wires, each of which is placed a small distance apart along the bar transversely of the chamber. Longitudinally of the chamber a number of such wire-carrying bars are fixed at distances apart to cross the chamber, with spaces between the bars for the free passage of the water on to the wires.

Although the invention has been mainly designed for the purpose of extracting tar from combustible gases, it is equally applicable for extracting or separating other suspended matter from gases, as, for instance, for recovering ammonia, in which case the wires would be coated with lead. The washing material, dependent upon the gas treated, could be either oil, tar, or an acid or alkali.

APPLICATIONS FOR LETTERS PATENT.

15,329.—Barker, W. H., Jun., "Conveyors for coal." June 27.
15,349.—Breeden, J., and Co., Ltd., and Breeden, F., "Valves for radiators." June 27.
15,351.—Guest, A. A., and Gibbons, W. P., "Machines for discharging and charging gas-retorts." June 27.
15,384.—Page, P. C., "Generating combustible vapour." June 27.
15,398.—Howlin, W., "Automatically opening and closing cocks, valves, and the like." June 27.
15,408.—Trezise, J. M. G., and Sheppard, W. J., "Photometers." June 27.
15,411.—Wilde, P. R., "Utilizing the waste heat of combustion products." June 27.
15,413.—Hind, R., "Regulating the supply of gas." June 27.
15,428.—Cassady, G., "Fluid pressure engines." June 27.
15,435.—Schuchardt, G., and A. Frister Akt.-Ges., "Incandescent burners." June 27.
15,447.—Bell, G., "Regulating the supply of gas." June 28.
15,488.—Grosser, J., and Fleischer, J., "Gas-heating stove." une 28.
15,512.—Ionides, A. C., Jun., and Swan, J. B., "Producing a combustible gas." June 28.
15,533.—Liddall, J., "Cooking-stoves for gas and solid fuel." une 28.
15,585.—Young, F. B., "Automatic gas lighting and extinguishing device." June 29.
15,687.—Huguenin, A., "Producing a difference of pressure in water, gas, and like mains." June 30.
15,707.—Teed, F. L., Sulman, H. L., and Picard, H. F. K., "Recovery of sulphur from gases." June 30.
15,741.—Robson, G., "Automatically operating gas-burners." June 30.
15,747.—Chevretot, H. A., "Automatic temperature recorder." June 30.
15,817.—Christie, M. G., "Manufacture of ammonium sulphate." July 1.
15,861.—Stobie, V., "Gas-producers." July 2.
15,877.—Burkheiser, K., "Preparation of ammonium sulphite or sulphate from gases." July 2.

New Water-Works for Bacup.—The Cowpe water undertaking of the Bacup Corporation, which was commenced in 1901, and has involved an expenditure of upwards of £230,000, will be officially opened on the 21st inst., by Mrs. J. H. Maden, of Rockcliffe House, the Mayoress of Bacup. The scheme includes a large low-level and a small high-level reservoir; the former having a capacity of 150 million gallons. When full, the large reservoir will have a water surface of 15$\frac{3}{4}$ acres; and it is estimated that it will yield a supply of 625,000 gallons per day, after discharging the compensation water the Corporation have to furnish.

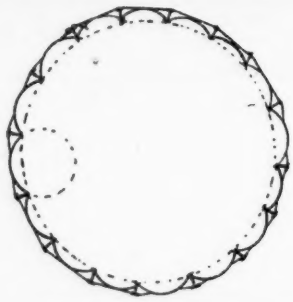
CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gasholder Tanks with Bulging Sides.

Sir,—The bottle-shaped gasholder tank described in the last issue of the "Journal" is a most interesting and ingenious departure from the ordinary mode of construction. It is scientifically sound, and obviates the use of very thick plates for the sides of large tanks, which are a necessity in the ordinary form of construction.

The invention reminds me of a tank that I patented in 1901, for attaining the same object. This tank was formed with fluted sides, as shown in the sketch; the object being to reduce the strain on the sides,



by splitting them up into a series of circular arcs of much smaller radius than that of the tank, with vertical posts at the intersections, united by a ring girder at the top. Of course, the greatest objection to this mode of construction is the enormous stress on the top girder; and if I understand the "M.A.N." construction rightly, it is open to similar objections.

It would be most interesting if M. Bonnet would add the following information to that he has already so ably and clearly given:—

(1) What is the section of the horizontal girder for the example described in his paper?
(2) In fig. 4, "Polygon of Strains," does the "Strain on the Horizontal Girder" represent the horizontal outward radial force acting at the summit of each of the vertical posts? Surely it is not the actual strain or stress in the girder itself?
(3) Are the posts put at a distance of 1 metre apart only all round the tank?
(4) Do not these outward forces induce great stress in the horizontal girder circumferentially? If so, how much?

M. Bonnet's paper is, by far and away, the most interesting and novel that has appeared for a long time on the subject of gasholder tanks.

71, *King William Street, E.C., July* 7, 1910. F. S. Cripps.

The Königsberg Chamber Settings.

Sir,—In the "Journal" for June 28, I read the report of the meeting of the German gas men at Königsberg and the visit to the Königsberg Gas-Works.

I am the designer and contractor or the inclined furnaces reported on. The slight delay in discharging the last chamber originated through the four-weeks trial-run having come to a close the very morning of the visit. It was the forced run of this trial which had caused some carbon to collect on the roof of the chamber through overheating. This carbon prevented the coke at once leaving the chamber. In this connection, I may mention that the coal which is being carbonized at Königsberg does not allow too strong a heat of carbonization. With too great a heat, the cake of coke gets disconnected and with the carbon forming a ledge, this breaks off a piece of the cake and makes the remaining coke stick.

Accidentally, on this particular day of the meeting of our congressmen, the mechanical discharge had a mishap, causing hand labour to be applied to work otherwise done by the machine. Afterwards, when the carbon ledge had been knocked away, and this particular chamber received its normal charge and treatment, everything worked smoothly, as several witnesses next day could testify.

On the day of the visit of our gas men, the result of carbonization was 37 c.b.m. out of 100 kilos. of coal—thus showing that the slight hitch had in no way affected the good working of the furnaces.

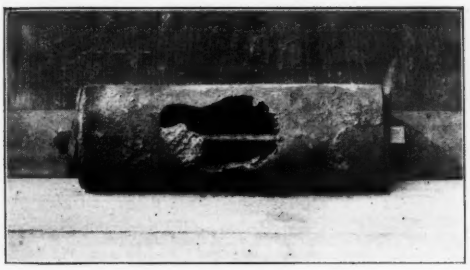
May I here express my personal views, which are that (I am fully convinced) horizontal chamber furnaces of my system are superior to any other system of furnaces at present on the market. They are cheaper in construction; are less susceptible with different kinds of coal for carbonization; they use less fuel; and they produce a better gas. If there be higher costs for labour, these are more than compensated for by these advantages.

Dortmund, July 6, 1910. Aug. Klönne.

A Result of Electrolysis.

Sir,—I made the enclosed photograph a few days ago; and the facts connected with it will, I feel sure, be of interest to readers of the "Journal." The photograph is a view of a piece of cast-iron casing-pipe, 2$\frac{1}{2}$ inches in diameter, through which passed an electric cable, insulated in the fashion in vogue some years ago. The history of the piece of pipe is as follows.

At midnight on Saturday, the 21st of May last, the police reported a serious escape of gas at all the electric-boxes surrounding one of the principal squares of this city. As all the gas-pipes in this particular square are in the roadway, and as the latter is laid in concrete and



setts, it required twelve hours' strenuous work to find out the cause of the escape, which was coming into the boxes in such volumes that it could be heard as it issued from the iron casing-pipes. By noon on Sunday, the cause was laid bare. It was found to be due to a fault in the cable, which had fused the casing-pipe at a point at which it crossed a 12-inch gas-main—passing over it at right angles and in contact with it. The 12-inch main was also fused; the hole in this pipe being about 1¼ inches in diameter, the sides of it containing some of the copper of the cable. A similar piece of copper can also be seen in the photograph, adhering to the left-hand side of the hole at the bottom. It looks whiter in the photograph—on account of its lighter colour.

Fortunately, no damage was caused by the escape, beyond the rousing of one household, into whose premises the gas was entering from one of the electric boxes in considerable quantities. The cable, it should also be stated, was laid some years ago, and in a manner which has since been abandoned.

The above particulars are taken from my report to the Gas Committee, dated the 26th of May.

A. M'I. CLELAND,
Superintendent of Mains,
Belfast, July 4, 1910. Belfast Corporation Gas Department.

P.S.—When cut out, the piece of pipe was found to have been cracked by the heat. It was, therefore, necessary to hold the pieces together by means of a long bolt, seen in the photograph.

The Coalite Company and their Patents.

SIR,—We observed in a recent issue of your paper a letter from Messrs. Hunt and Co., confirming as "substantially" true certain misstatements made by you as to the coalite patents.

The misstatements were that the Coalite Company had been unsuccessful in "defending" their master patent; and that the "stupid pretensions of the coalite people, in respect to a monopoly for the production of a sort of half-carbonized coal, was knocked on the head."

These statements are neither actually nor "substantially" correct, nor have they the shadow of truth; and it is a matter of regret to us that Messrs. Hunt should lend their name to confirm them.

It is well known that the distinctive feature of the coalite process is the arrestment of low-temperature distillation at a particular stage, to produce a residue having the characteristics determined by those conditions of treatment.

In the application to which reference is made, there is no claim to arrestment of the distillation at any stage. What is claimed is the use of steam throughout the whole process of a low-temperature distillation, as distinct from its use at the beginning or the end; and great virtue is claimed in that, by such use of steam, the temperature of the retort is kept down.

Apparently, the fact around which these misstatements have gathered is that the Coalite Company did not stop the grant of a patent on this application, on the ground of their own patent. But the use of steam in carbonizing is well known, and no claim to its general use was made in the coalite patent—the fact being other prior patents were relied upon as anticipations by the Coalite Company in their opposition.

It is known to use steam throughout a carbonizing process; and so long as its use does not infringe any existing valid patent, it is unobjectionable. But if, for example, steam be used in the coalite process by others than the licensees of the Coalite Company, it follows that the coalite patent is infringed, and the issue of infringement could only be determined in the High Court. These circumstances, however, have not arisen; and therefore to say that the Coalite Company have been unsuccessful in defending their patent, in circumstances where the patent has never been attacked, is absolutely untrue, and being untrue its publication is indefensible.

Finally, we would suggest that by your reference to the "stupid pretensions" of the Coalite Company, your hostility carries you beyond the limits of your criticism. No higher testimony can be adduced to the patentability of any invention than has been adduced in respect to the coalite process, in that patents have been granted upon it, after investigations, in Germany, the United States, and in every other country where the grant of patents is only made as the result of an investigation as to novelty and patentability; and the criticism that you have offered is more than met by the grant of those patents.

Chancery Lane, W.C., July 4, 1910. EDWARD EVANS AND CO.

["It is well known that the distinctive feature of the coalite process is the arrestment of a low-temperature distillation at a particular stage, to produce a residue having the characteristics determined by those conditions of treatment." Just so. The use of steam is also well known in carbonizing processes; and so is the use of low as well as high temperatures. There is no necessity to discuss here the question of patents with Messrs. Edward Evans and Co. That firm, Patent Office records, or Patent Office officials—whether British, German, or American—cannot teach us the whole history and practice of carbonization; for the simple reason that much of the practice has never been the subject of patents.—ED. J.G.L.]

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Fylde Water Board Bill, Paisley Gas Order Confirmation Bill, Water Provisional Order Bill.

Bill read a second time and committed: Shirebrook and District Gas Bill.

Bills reported, with amendments: Glasgow Gas Consolidation Bill, Mallow Urban District Gas Bill.

Bills read the third time and passed: Abertillery and District Water Board Bill, Brighton and Hove Gas Bill, East Grinstead Gas and Water Bill, Egremont Urban District Council (Gas) Bill, Exmouth Gas Bill, Exmouth Urban District Water Bill, Gas Orders Confirmation Bill (No. 2), Worksop Urban District Council Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Abertillery and District Water Board Bill, Gas Orders Confirmation Bill (No. 2).

Lords Bill reported: Great Grimsby Gas Bill.

Bills read the third time and passed: Fylde Water Board Bill, Garnant Gas Bill [Lords], Matlock Bath and Scarthin Nick Urban District Council Bill [Lords].

The Montrose Water, &c., Order Confirmation Bill, to confirm a Provisional Order under the Private Legislation Procedure (Scotland) Act, 1899, has been presented, read the first time, and ordered for second reading.

BROWNHILLS AND DISTRICT GAS ORDER.

This Provisional Order, by which the Brownhills and District Gas Company sought to maintain their existing gas-works and construct further works, came before the Committee of the House of Lords presided over by Lord DONOUGHMORE for confirmation last Tuesday.

Mr. BELL (Parliamentary Agent) appeared for the promoters; and Mr. VESEY KNOX, K.C., represented the Walsall Corporation, who petitioned against the Order.

Mr. BELL said that for forty years past, with the consent of the Local Authority, the promoters had been supplying gas within the Brownhills district; and they asked, by this Order, for statutory confirmation of what they had done. The only objectors were the Walsall Corporation; and in order to meet their objections, the promoters agreed, subject to the approval of the Board of Trade, to insert a new protective clause in the interests of the Corporation. The Board of Trade struck out two paragraphs of the clause which the promoters agreed to insert. As the agreement was to be subject to the approval of the Board of Trade, he could not well object; but it seemed to him that the Board of Trade should state their reasons to the Committee for refusing to accept these two paragraphs. He had received a letter from the Board of Trade in which they stated that they objected to the proposed clause on the ground that it embodied section 46 of the Walsall Gas Act of 1876, which gave the Corporation power to supply gas within the neighbourhood of the borough. This, the Board of Trade considered, was far too wide. He agreed that if it were proposed to insert such a clause in the Bill at the present time it was very doubtful if Parliament would allow it.

Mr. VESEY KNOX said the matter in dispute was entirely one between the Walsall Corporation and the Board of Trade, because the promoters had loyally carried out their part of the undertaking. The Corporation simply asked that they should be allowed to continue to supply the district which at present came within their area of supply; and the Company agreed that they would not supply Steelfield and the part of Walsall Woods which came up to the borough boundary.

Mr. BELL said he failed to see why a saving clause like this, which could do no harm to anybody, should not be inserted in the Order. The Board of Trade appeared to have nothing to say in the matter. He thought therefore that their Lordships were entitled to insert the clause as drawn.

The CHAIRMAN: If the Board of Trade do not think it worth while to come before us, we have no option but to insert the clause.

Mr. BELL said, as to the second part of the clause, he was entirely in their Lordships' hands. It had reference to the protection of the Corporation tramways undertaking. The Board of Trade objected to the proposed clause on the ground that it was unnecessary, and that the Corporation had all the protection they needed in the Order as it stood, and in the provision of the Gas-Works Clauses Act, 1871, which was incorporated in the Order.

Mr. VESEY KNOX said the Corporation had tramways which ran right out to Brownhills. They had cost some £25,000; and they asked to have a clause inserted for the special protection of the tramway lines and electric wires. The Board of Trade ruled that the Corporation had sufficient protection under the general law, and struck out the special protection which they asked for.

Mr. HONEY, who now appeared on behalf of the Board of Trade, said he had no instructions to appear in this matter. Mr. Bell had read a letter which the Board sent to the Agent of the Walsall Corporation explaining the grounds on which they objected to the proposed new clause. They had also communicated a copy of the letter to the Agent of the promoters.

The Committee decided to insert the proposed new clause in its original form.

GAS COMPANIES (STANDARD BURNER) BILL (NO. 1).

House of Commons Committee.—Monday, July 4.

(*Before Sir* HENRY KIMBER, *Chairman, Mr.* BALDWIN, *Mr.* A. G. C. HARVEY, *and Mr.* F. W. S. M'LAREN.)

This Bill came before a Committee of the House of Commons, constituted as above, for consideration to-day.

The promoters were represented by the Hon. J. D. FITZGERALD, K.C., Mr. HONORATUS LLOYD, K.C., Mr. C. C. HUTCHINSON, and Mr. PADDON. Counsel appearing for the petitioners against the Bill were: For the Mersey Docks and Harbour Board, Mr. BALFOUR BROWNE, K.C., and Mr. TALBOT, K.C.; for the Liverpool Corporation and other Councils, the Bootle Corporation, the Hastings Corporation and Torquay, Mr. RAM, K.C., Mr. TALBOT, K.C., and Mr. COURTHOPE MUNROE.

Mr. FITZGERALD opened the case for the promoters at considerable length. He said the Bill was promoted by eight companies, and dealt with the standard burner used in testing the illuminating power of the gas supplied by these companies. The other two Bills (Nos. 2 and 3) dealt with the same question. Two instructions had been sent to the Committee; the first being: "That it be an instruction to the Committee on the Bill that they do hear the case of the promoters, the Liverpool United Gas Company, separately, and do, on the request of any of the petitioners, consider the expediency of dividing the Bill, in order to remove any difficulty that may, in their opinion, be proved to exist (by reason of the inclusion of several cases in the Bill) in the submission separately of any of the cases in opposition." There was a general instruction to the same effect referring to all the Bills before the Committee: "That it be an instruction to the Committee on the Bill that they do, on the request of any of the petitioners, consider the expediency of dividing the Bill in order to remove any difficulty that may, in their opinion, be proved to exist (by reason of the inclusion of several cases in the Bill) in the submission separately of any of the cases in opposition." Accordingly, in opening the first Bill, he did not propose to open the Bill so far as the Liverpool Gas Company was concerned. He proposed to treat their case as a separate case, and when the hearing of the other cases had been concluded, to take the Liverpool case as a separate Bill.

Mr. BALFOUR BROWNE objected to this course.

Mr. FITZGERALD said he understood that the Liverpool case was not to be taken first; and therefore he was only prepared to open the general case.

Mr. BALFOUR BROWNE argued that the Liverpool case covered the whole case, and something more.

Mr. RAM, who appeared for the Liverpool Corporation, contended that the Liverpool case would clear the way for every other case.

Mr. FITZGERALD said that Liverpool had certain special features that were not to be found in the other cases.

The CHAIRMAN eventually announced that Mr. Fitzgerald would have to take the responsibility of what happened afterwards. He was entitled to conduct his case as he pleased. If the Committee found that they could not appreciate the case from the opening upon seven-eighths of it, they would call upon him to go on with the case of the Liverpool Company.

Mr. FITZGERALD undertook to take the responsibility. He said the Bill was largely unopposed, as were also the other two Bills. The first Bill was promoted by eight companies; and its object was to enable them to adopt as the burner for testing the illuminating power of the gas the improved burner known as the "Metropolitan" argand No. 2. This burner had been prescribed by the London Gas Referees for use by the London Gas Companies; and it had been in use by them for the last five years. It had also been adopted by the Board of Trade under the advice of their technical advisers; and it was the burner which was inserted in any Provisional Orders made by the Board of Trade for the purpose of testing gas. It had also, under the authority of Parliament, been adopted by a number of gas companies and local authorities; so that altogether there were between 80 and 100 companies and local authorities who were to-day using, or in a position to use, the burner. The authorities of the two Houses, in the "Model Clauses" which they issued every year, had adopted the burner with regard to the testing of gas. Parliament had over and over again sanctioned the use of the burner; and it was established as the best one in existence for the purpose of testing gas. It ought not to be a question every session as to whether or not it was the best burner. But the suggestion was that, because the companies were getting rid of a disadvantage which they ought never to have been subjected to, and because they would be able to supply gas of less illuminating power than Parliament intended them to supply, they ought to reduce the price of their gas. The simple answer to the whole of this contention was that it was only an act of justice. They were only putting themselves in the position of supplying gas which Parliament intended they should supply. If the matter was to be considered further, there was this complete answer—that any economy which resulted in the manufacture of gas under the existing gas legislation invariably went, either in whole or in great part, to the advantage of the consumer. The companies were either sliding-scale or maximum-price companies; and two of the local authorities who were opposing the Bill had in their districts—one the Hastings Company, which was a sliding-scale Company, and the other the Torquay Company, a maximum-price concern. But in the case of all sliding-scale companies, they could not increase their dividend without lowering the price of gas; and the effect of this was that the greater part of the benefit went to the consumer and not to the shareholder. It depended, of course, on the amount of capital and the quantity of gas sold; but, broadly speaking, the consumer got three or four times as much pecuniary benefit. Where they were dealing with a maximum-price company, who were paying their maximum dividend (as in the case of the Torquay Company), the whole of the benefit went to the consumer. If, by the adoption of the standard burner, the economy was £500 or £1000 a year, that inured to the benefit of the consumer in the shape of a reduction of the price of gas, because the shareholders, being in receipt of their maximum dividend, could get no more. On various occasions the question had been raised as to whether it ought to be accompanied by any reduction in the price of gas, and as far as he was aware there was only one case where any reduction was made. There were many cases where the illuminating power had been reduced, as in the case of the London Companies, where they were allowed to reduce the illuminating power from 16 candles to 14 candles. There they were called upon to make a reduction in price. But with regard to the adoption of the standard burner, the only case he knew of where it had been accompanied by a reduction in the price was that of the Brighton Company. In that case, however, there were other advantages which the Company were getting—including what was known as a capital redemption fund. In the present instance, he would ask the Committee to adhere to the practice of allowing the companies to have the best burner for developing the light of the gas supplied, which was what Parliament intended, and not to make any alteration in the standard price. The saving, in fact, was very small. It represented about three-eighths of a penny per candle per 1000 cubic feet. So that if there were even a difference of two candles made by the use of the standard burner, the resulting economy to them would be represented by ⅜d. per 1000 cubic feet. They were asking to be placed in a position to supply what Parliament intended them to supply—in most cases, 14 candles. In the other House, it was suggested that, as far as the incandescent burner was concerned, it might make very little difference; but that where persons were using the old flat-flame burner it did make a very considerable difference in altering by a couple of candles the gas supplied. He believed the Committee would find that this was not the case; and with the ordinary consumer, even if he was using a flat-flame burner, that the difference was not apparent. About 90 per cent. of the gas now used was consumed in incandescent burners; and in some places the flat-flame burner had almost disappeared. On this Bill, as on every Gas Bill that had been promoted during the last few years, the petitioners against the Bill always raised another point, whatever the Bill was for. At present, gas companies were required by the General Acts and by their Special Acts to test the illuminating power of gas, and there was not a single case where Parliament had put upon a company, against its will, a test for the calorific value of gas. The only case of a company which was under an obligation to test the calorific value of the gas subject to a penalty, was the Gaslight and Coke Company. The provision was there inserted not by the decision of Parliament, but by agreement in the Bill dealing with a great burden of important matters, and was settled between the Company and the London County Council. The time might come when it would be considered that the calorific value of gas was more important, and accordingly Parliament would substitute a test for calorific value instead of one for illuminating power; but it would be most undesirable in the case of an ordinary company or local authority to have the two tests. Some of the petitioners had raised other questions which were not at all germane to the Bill. One had raised the point as to whether the provisions of the General Act of Parliament as to the reinstatement of roads were sufficient. There was nothing in the Bill dealing with the laying of pipes. In the other House, it was put forward that the effect of adopting the new burner, by altering the actual quality of the gas supplied—reducing it in some cases from 15½ to 14 candles, or whatever it might be—it would have an unfortunate effect on the gas-engines in use. They also said there was no such thing as 14-candle power gas. With regard to the scrapping of gas-engines, in Glasgow they originally supplied 25-candle gas. They had gradually reduced the illuminating power; and this year a Bill promoted by the Corporation had already passed the two Houses reducing the illuminating power to 14 candles. Though this Bill, in respect of other matters, was most fiercely contested, no objection was raised to the testing provision. Important places—such as Scarborough, Croydon, and Swansea—were raising no objection to the present Bill. The Corporations of Scarborough and Swansea appeared in opposition in the other House, and, having heard the discussion there, they had not renewed their opposition in this House.

Mr. Charles Carpenter's Evidence.

Evidence was first given in support of the Bill by Mr. *Charles Carpenter*, the Chairman of the South Metropolitan Gas Company. He said the No. 1 London argand, the invention of Mr. William Sugg, was selected by the Metropolitan Gas Referees because it developed to the best extent the light-giving power of the gas, and was at the same time practicable for the consumers' use. In those days coal was distilled in an extravagant manner, and large quantities of expensive cannel coal were used to bring the illuminating power to the prescribed standard. These conditions had now come to an end; and it would be impossible to revert to them. Before many years had passed after the adoption of the burner, its defects became increasingly manifest; and in 1870, Mr. Charles Hunt called attention to these defects. The burner was constructed for a particular quality of gas which was made at the time of its invention. In those days, gas was distilled from coal at a comparatively low temperature, and a very low yield of gas was the result. The flame from the burner rose almost to the top of the chimney, and very nearly filled the chimney itself. As gas distillation was conducted on a more scientific basis, it was seen that the yield of gas that was satisfactory in those days was very uneconomical—a higher temperature was obtained and a greater volume of gas distilled from the coal. The gas distilled with the higher temperature had not a higher proportion of hydrogen; and the flame from it was very low indeed. In one case they had a flame which almost filled the chimney; and if they used a flame which was shorter, a much larger volume of air rushed upwards, with the consequence that the gas was overburdened. One of the defects of the burner was that too much air was admitted, and the luminosity was destroyed. Instead of indicating the true luminosity of the gas, it destroyed it. This was a defect which gas companies had been suffering from since the burner was first introduced.

By the year 1891, the defects of the burner had become so glaring that the South Metropolitan Gas Company offered to bear the entire cost of an independent Committee to undertake an investigation into the matter if the Board of Trade would appoint one. The interest in the question increased throughout the country; and in 1893 a deputation on the subject waited upon the Committee from the Institution of Gas Engineers. Professor Harcourt, the Senior Metropolitan Gas Referee, was fully aware of the defects of the burner; and in 1890

he publicly stated that by its use any deficiencies in the gas were greatly exaggerated. The Referees endeavoured to get over its defects by using it quite regardless of the quantity of gas being consumed in it; and this method received parliamentary sanction in 1900. The Act said the gas was to be burnt in the burner at the rate of 5 cubic feet per hour; and the Referees proposed to get over the difficulty by saying "you shall burn it at such a rate as will give a light of 16 candles." The 16-candle flame was much more nearly the size of the flame that was produced from the gas made by the burner invented, and the amount of air passing through between the flame and the chimney was more nearly in accord with the burner. The Referees then said: "Do not burn your gas at 5 feet an hour, but at whatever rate is required to make a 16-candle flame; and when you have done that, by a rule-of-three sum, supposing the rate were 4 feet for 16 candles, 5 feet would give 20." This was legalized in 1900. Five years later, in 1905, the London County Council reopened the whole matter. The question arose as to what was the use of having a method of testing a gas the object of which was to tell the consumer what he was getting, when he had not the least idea of what was going through the burner. It was then said that the only proper way of testing the gas, in order to tell the consumer what he was really getting, was to pass it through at the 5-feet rate.

The matter was thrashed out at great length before a Committee of the Upper House. The Committee decided—and he thought that they were impressed by the evidence placed before them of the consumer knowing what gas was put into the burner—that the 5-feet rate should be reinstated. But they said, "in making your test, you shall have a burner which is so arranged that the air supply can be regulated." As a result of the Committee's recommendation, he had invented the No. 2 "Metropolitan" argand, which was provided with a chimney just in the same way as the No. 1. The difference between the burners was that underneath the No. 2 there was a shutter, which was moved up and down in the same way that the wick of a lamp was turned up and down. Having adjusted the 5-feet rate, the shutter was turned up or down to admit sufficient air into the orifice below the burner to burn the gas with a proper light inside the chimney.

There was a clause in the London Gas Act of 1905 which gave the Referees power to prescribe a better burner, because, of course, his burner might not turn out to be the best. The whole object of the Legislature was that the gas should be accurately tested—that whatever method was used for testing the illuminating power, it should be one that would produce the full illuminating power from the gas. No privilege was granted by giving them this burner; but it removed an injustice from which not only the companies but the consumers suffered. The measuring instruments destroyed a certain amount of the luminosity; and money had to be spent in providing for this loss. The burner would enable the gas purveyor to provide the article which Parliament intended he should supply; and it enabled him to do it in the most economical manner, both to the company and the consumer. In London alone, hundreds of thousands of pounds had been wasted; and it was the consumer who had to provide this money. The gas in London had been tested with this burner for five years. The object of the Bill was to confer the undoubted benefit to London or other towns in the country. The continued use of the No. 1 argand necessitated artificial enrichment of gas with American oil or petroleum spirit, when it would be more economical to the consumer if he were supplied with the gaseous products of the distillation of coal. The consumer was adequately protected; for the character of his supply could be kept of more constant quality, and great fluctuation in the quantity of the rich hydrocarbons present was avoided. In this way, better efficiency was obtained from the incandescent burners commonly in use. It had been suggested by the opponents to the Bill that if the change in the burner was permitted there should be some *quid pro quo*. But Parliament had authorized the change to a large number of companies and local authorities in the Provinces, and they desired to have the commodity accurately measured. Their financial position had been settled and their prices fixed by Parliament always on the assumption that the commodity would be accurately measured.

In reply to the CHAIRMAN, witness said that in 1870 the price of coal jumped from 6s. to 20s., in consequence of which the various gas companies increased their prices for gas in order that they might continue to pay the full dividends that they were entitled to pay. This was not thought fair by Parliament, because in 1875 the sliding-scale was introduced, and if, owing to better methods of manufacture, a company was able to make gas more economically, it shared it with the consumer, who got a proportion of five-sixths—the company getting one-sixth. If the price of coal were to rise, and the cost of making the gas was greater, the burden again fell on the consumer and the company in the same proportion. If there was an economy arising from the use of this burner, it would go to the consumer. With regard to companies where the standard charge was the maximum price, and where the company was paying its maximum dividend, any saving necessarily went to the consumer. Hastings was a sliding-scale Company; and Liverpool and Torquay were both maximum-price Companies paying their maximum dividends. It was alleged in the other House that the substitution of this burner would compel the consumer to increase his consumption in order to get the same amount of heat or light. The change was made in the case of his Company five years ago. The whole of their make of gas had been carefully metered; and it was found that there was no big increase in the amount of gas burnt by the consumer now to what there was before the change came in vogue. It was suggested that the consumer would have to burn 25 to 30 per cent. more gas; but they were not sending out the gas, nor was the consumer buying it. This was also the common experience of other districts which had effected the change.

Mr. HONORATUS LLOYD: Does the reduction of illuminating power mean a corresponding reduction in the calorific power?

Witness: No; the two things do not go together. You can have a considerable reduction of illuminating power and a very slight reduction of calorific power. For instance, you might make one gas of 16 candles and you might make another gas of 14 candles, and the 14-candle power gas might have a higher calorific value than the 16-candle gas. There is no definite relationship between the two.

Replying to the CHAIRMAN, witness said one test could not be applied to the two. They had taken out the whole of the tests made by the London County Council of the Gaslight and Coke Company's gas. They found that 17·3 candles gave 140·1 calories, 16·8 candles gave 141·8, 16·3 gave 141, 16 gave 141·7, and 15·5 gave 140·5.

Mr. BALFOUR BROWNE remarked that he understood Liverpool was to be taken separately, and that the Liverpool United Gas Company had to prove their case. At the same time, Mr. Carpenter had gone over a good deal of general principle; but when the Liverpool case came on, he took it that the witness would then be recalled and cross-examined.

The CHAIRMAN: I do not see any objection to that.

In reply to Mr. RAM, who rose to cross-examine on behalf of Hastings, witness said that anyone who was accustomed to burn oil in a lamp—and the poorest of the poor were accustomed to do so—could use his burner. For test purposes, the price of the burner was three guineas. The reason for this was that it was made to the exact measurements prescribed by the Referees' instructions; and it was the measure by which hundreds and thousands of pounds' worth of gas was sold every year. But if the burner was to be used by the consumer instead of the incandescent burner, he had obtained from a Birmingham firm an estimate of the cost at which they could provide them. They could manufacture and supply the burner for 10s. per gross net, which worked out at about 9d. each. To this would have to be added the cost of the dies, which would be about £120; and this cost would have to be distributed over the number of burners made. If the burners were in general use, and if there was no mantles, an order for 10,000 burners would be quite small, and for the cost of the dies another 2d. or 3d. would have to be added to the 9d. He had ascertained this since he was examined before the House of Lords Committee. If they were made in ten thousands, they would come out at under 1s. each. For the flat-flame burner they paid 2d. or 3d. each; and a good incandescent burner cost 9d. or 1s. This burner was simply for the purpose of burning gas in order to get from it its inherent luminosity. If the burner was going to burn 5 feet only, there would have to be a little regulator which would make the burner stand up a quarter-of-an-inch higher. In the use of the burner, if the shutter were closed, the flame would burn right up above the chimney: and the consumer would then turn down the shutter until the proper flame was obtained. He could not accept at all that with the burner the companies would be able to give the consumer worse gas than he was getting to-day. He would get a gas that was in the minds of Parliament as the illuminating power that should be given.

Mr. RAM: Would the gas be of less illuminating power?

Witness: It would be the illuminating power that Parliament intended.

When the consumer turns on his gas-burner, would he get a less light than he is entitled to to-day?—The result of using the burner will be that part of the luminosity will not be destroyed.

In reply to the CHAIRMAN, who asked whether the gas supplied through the burner would give less light than the gas which the consumer was supplied with to-day, witness said that if the same gas were burnt in the old burner, owing to its faulty construction, a portion of the illuminating power was destroyed, and it did not give the full result. But with this burner, they produced a gas which was decidedly more economical.

Mr. RAM: Is it a fact that the consumer will, with the new burner, get gas of less illuminating power than he is getting to-day?

Witness: Of course he would. That is the whole object of the Bill, that he has something which is now waste to him.

The CHAIRMAN: If the Bill is passed would he get less light?

Witness: No; he would get no less light than before.

Mr. RAM: I am speaking of the consumer who is using a certain burner to-day. The gas is being tested with the No. 1 burner. You will take away the No. 1 and test with the No. 2. The consumer will turn on the same burner and get less illuminating power in his light than he would to-day, would he not?

Witness: He will if he sticks to that burner; but he will be given a burner by which he will get more.

Will he get less in the way of light and heat than before?—Not necessarily.

Over and above the saving to the company and the loss of light and heat, if, in addition to that, there is a loss to the consumer, do you agree that he ought to have some compensation?—If there is a loss to the consumer, he ought to have compensation.

Replying to further questions, witness said he did not agree that the purveyor of gas would be enabled to send out gas of a candle power less by 3·16. The consumer was getting more than Parliament gave him, and much more than he wanted. In the flat-flame burner it would be a little less; but in the incandescent burner, he would very probably get more, because nearly all incandescent burners were made for low-quality gas.

Mr. RAM: Is it your case that, after you have saved what you call the loss of illuminating power to the company, this will be the only benefit the company will get?

Witness: The company want to save wasteful expenditure.

Is that all?—Undoubtedly it puts the company in a better position to meet the competition in which it is involved with electric lighting undertakings. It strengthens their position in the competition they have to meet. The value of a candle has been estimated at three-eighths of a penny per 1000 cubic feet. With regard to the Hastings Company, the substitution of the No. 2 argand will be an advantage to the consumer.

Mr. RAM: The burner you propose to use will make a difference in the illuminating power of the gas that the consumer will get?

Witness: It will make a difference.

In re-examination by Mr. PADDON, witness said the No. 2 burner would give the absolute value of the gas, and it would enable them to compare the working of one town with another. This was a very important thing to be able to do; and it was a thing which could not be done at present. Now, there were a number of unreliable results in comparing one gas with another. Tests had been made with the same gas between two burners showing a difference of over two candles; but the consumer, in using the gas, would not experience the disadvantage of any such difference as this. Some 90 per cent. of the consumers in the case of his own Company were using incandescent burners, and would not be affected.

Tuesday, July 5.

Professor Vivian B. Lewes's Evidence.

Evidence was given this morning by Professor *Vivian B. Lewes*, the Chief Superintendent Gas Examiner to the Corporation of the City of London. He said it was of the greatest importance to bring about uniformity in the method of testing gas. The adoption of the No. 2 burner would practically do away with the irregularity as to illuminating power, and they would have a candle power meaning a certain definite consumption, which would convey to one's mind what the value of the gas was. This was of the greatest possible importance to the consumers themselves, because it would give power to gas manufacturers of standardizing their apparatus. If they had the standard burner, they must have a universal method of testing; and the large apparatus makers would be able to sell stoves for 14, 15, 16, and so on candle power. Thus the cost of manufacture would be reduced; and it would be of enormous benefit to the consumer as well as to everybody else concerned in gas manufacture. At present, the manufacturer did not know what 14-candle power gas meant; but if the standard burner were allowed to be used, he would know that he had to supply a burner for a stove for dealing with a thing of a definite value. Under the London Gas Act of 1868, the Gas Referees were appointed, and the test-burner to be used was one which should be suitable for obtaining from the gas the greatest amount of light, and one which should be applicable for use by the consumer. As gas was being made at that time, the No. 1 argand fulfilled these two conditions. It was adapted to burn 5 cubic feet per hour for a certain quality of gas, and admit the proper quantity of air for the consumption of the gas. The air admitted exactly burnt the gas to the right point for developing from it the greatest amount of light. But if gas was put through the burner which required more or less air, the burner could not supply the greater or the less quantity of air. It was designed to test a gas of one kind and quality. If the burner were used for a gas which was richer in hydrocarbons and needed a greater quantity of air, it would smoke, and the full effect of the gas would not be obtained. If they took a gas which required for its perfect combustion less air in the aperture, the carbon in the flame was rendered luminous and was burnt up too quickly. The burning of gas of a lower candle power than 15 diminished the amount of light the gas was capable of using. Perfect luminosity was only obtained when there was the proper amount of air. From the years 1868 to 1889, the gas was of 16-candle power. If 14-candle power gas were forced through the burner, it would not give the proper illuminating power the gas was capable of giving. The company would have to force through a gas of 15½ or 16 candles.

There were many mixtures of gas, each of which took its own particular volume of air; and the luminosity of the flame in the chimney was governed by the flow of gas, and with the old-fashioned gas they got less light-giving conditions. He was quite satisfied that the No. 1 burner required, in order to fulfil the statutory requirements of the 14-candle power gas, that 15½-candle power gas should be forced through it. In order to do their duty, the gas companies had to give the consumer more than he was entitled to. If the No. 2 burner were brought into use, the consumer would be getting a real 14-candle power gas; whereas previously he had been getting 15½-candle power. He would be getting his statutory legal right, which previously he had been unable to obtain on account of the inaccuracy of the instrument. The gas companies would be in a position to give the consumers what Parliament intended them to have.

With regard to the flat-flame burner, it was rapidly dying out. Less than 10 per cent. of the burners now used were flat-flame. This burner had now been practically substituted by the incandescent burner. The mantle gave such an enormously increased light over the argand that on the Continent flat-flame and argand gas-burners were dead. Here they were progressing rather more slowly; but it was in the right direction. In the more progressive towns, it would be found that 92 per cent. used the incandescent mantle.

In distilling two kinds of coal, it was possible to get two gases, which were enormously different in their composition. Cannel coal gave a different gas to South Yorkshire coal. The manufacture of gas had changed enormously. Up to the year 1889, they had practically pure coal gas. In America they had carburetted water gas, which proved very successful: and early in the nineties it had become established in this country. From that time down to the present it had been very largely used in conjunction with coal gas. It offered very great advantages to the gas manager, because gas could be made very rapidly. It offered a great advantage to the consumer, and cheapened the initial cost of the plant. Hydrogen and carbon monoxide were the two base gases. Instead of getting a 3-inch flame which they had been obtaining with coal gas, it dwindled down to 2½ inches; and it was manifest that there was too much air going into the burner and destroying the amount of light obtained from the flame. Mr. Charles Carpenter had arrived at the practical idea that what was wanted was an adjustment of the quantity of air to the quality of the gas. In the No. 1 argand, the amount of air was fixed by the burner, and it was not possible to get a true return. But with the Carpenter burner they obtained the true result—namely, the burner which was most suitable for securing from the gas the greatest amount of light. The burner could be used by any consumer. It was perfectly simple. The only question was price; and it was found that it could be bought at the same price as the ordinary incandescent burner. It required no more adjustment than the top of the ordinary flat-flame burner. The great objection which the opponents to the Bill appeared to have was that the introduction of this burner would enable the companies to supply gas of a lower illuminating and heating power. If it were possible for the gas companies to work down absolutely to the figure, it undoubtedly would be the case that it would enable the gas manager to make gas of 1½ to 2 candles less. The Gaslight and Coke Company were supplying a 15½-candle gas. Gas managers had an intense objection to being fined for half-a-candle less power. As a rule, the gas sent out by them was far above the ordinary standard. His experience was that with gas of the poorer quality, from 14 to 15 candles, the "London" argand destroyed from 1 to 2 candles. One of the finest object-lessons that the country had had in gas lighting was when, some years ago the late Sir George Livesey desired to reduce the illuminating power of the South Metropolitan Company's gas. The County Council met him in a very cordial spirit, and said: "Very well, reduce your candle power, and let us see what the effect on the consumer is." The candle power was reduced for six months, and there was not a single complaint. On the old burner there was practically no connection between the calorific power and the illuminating power. With the standard burner, which would bring out the true illuminating power of the gas, there was a slight difference; but they would require to have two or three million tests before they could arrive at it.

As to the difference between the flat-flame and incandescent burners, he said it would be found that with the flat-flame consumer there would be a certain loss of light; but it would only be a very slight difference. With regard to the incandescent consumer, he ventured to say it would make no difference at all. By regulating the burners, they would get a very slight rise in the illuminating value of the gas. It was the temperature of the flame which created the light; it depended upon the rate at which the gas was burning. With regard to power and cooking, the difference of one or two candles would, in all probability, be perfectly inappreciable to the ordinary consumer of gas for these purposes.

In cross-examination by Mr. TALBOT, witness agreed that it was very easy, by mixing gas in different proportions, to vary the mutual relations of illuminating power and calorific value. Roughly speaking, the more water gas they mixed in, the lower would be the heating value. The effect of bringing the gas down to 14 candles with the new burner would be that the consumer would get a gas from 1¾ to 2 candles less in value. The object of the gas companies was to get the burner which would give accurate results. If they made a profit on the transaction, the profit, with a sliding-scale company, would go to the consumer in a certain proportion; and with the maximum-price company, the whole of it would go to the consumer. When the No. 1 burner was inserted in the various Acts, it was the best for the purpose. The No. 2 burner had been invented and the definition of 15-candle gas had been changed. He would not dispute that they could have the same gas and burn it with a dozen different burners and each would give a different illuminating power.

Re-examined by Mr. PADDON, witness said the No. 1 burner was only suitable for one form of gas, and failed to conform to the Act. When the No. 2 burner was prescribed in connection with the London companies, it became more generally adopted by the Provincial companies; and it was on the assumption that it was thought to comply with the prescription that it should get the greatest amount of light from the gas. The No. 1 burner might be compared to the pound weight that did not weigh a pound. There was a difference in the laboratory between the two burners of about 2 candles; and it would be very nearly as much as if the consumer was using a flat-flame burner. But if the flat-flame burners were collected and tested, he thought there would be hardly a burner which would give 5 candles. The change would have no effect on 90 per cent. of the consumers. If the gas distributed to the public was below the standard value, the No. 1 argand would exaggerate the difference; whereas the No. 2 did not. It was possible to get a gas of lower illuminating power than another, and yet of a higher calorific value. The No. 2 burner had started the province of what was called economic gas manufacture.

Mr. W. J. A. Butterfield's Evidence.

Mr. *W. J. A. Butterfield*, the Secretary to the Metropolitan Gas Referees, then gave evidence. He said he had made a special study of gas legislation with respect to illuminating power in London. The Metropolitan Gas Act of 1860 first made uniform provision for testing the illuminating power of gas by the argand burner, which consumed 5 cubic feet per hour. He thought the No. 2 burner went as nearly as any burner could do to develop from the gas the greatest amount of light. The question of the burner was quite independent of the standard or maximum price imposed by Parliament. The No. 1 burner was an exaggeration of what Parliament intended in connection with testing arrangements. If the No. 2 burner were adopted, it would be very unfair if there were any alteration of the financial basis of the London Gas Companies, seeing that the Metropolitan Companies had obtained the use of the burner without making any concession at all. There was no definite relation between the light given by the flat-flame burner and that given by the No. 1 argand in testing the same gas. There was a fairly definite relation between the light afforded by a flat-flame burner and that afforded by a No. 2 argand burner with gases of different quality. The difference as between gases of different qualities by the No. 1 burner was greater than the difference in the light afforded by the same gases in the flat-flame burner. It would certainly be unfair to contemplate the imposition of a calorific power standard associated also with the illuminating power standard. In the one case in which the calorific power test had been imposed—that of the Gaslight and Coke Company—it was imposed after the Company had introduced the No. 2 "Metropolitan" argand burner for testing purposes. There was room for further investigation before a calorific standard was determined upon; and he thought each company should have a period during which it might obtain information as to the calorific power of the gas supplied. He did not think the change in the proposed burner had ever had, or could have, the effect of making the consumer burn more gas. What harmful effect there was would fall upon the flat-flame consumer.

In reply to Mr. TALBOT, witness agreed that with a lower-grade gas more must necessarily be burnt to give the same light in the flat-flame burner. He believed it was the fact, with regard to incandescent lighting, that if one were to ask for a burner to consume 14-candle gas and one to burn 15 candles, a different burner would be supplied.

Mr. TALBOT: With regard to heat, do you say you would not have to burn more gas with a lower quality to get the same heat?

Witness: That assumes that the calorific power of the gas increases in increasing the illuminating power.

Does the calorific power vary with the illuminating power?—The 14-candle coal gas as supplied in one district in London, on the average, is of slightly higher calorific power than 16-candle coal gas in the same district.

If you lower the illuminating power of the gas the calorific value follows?—Yes.

And above 14 candles, there is no relation between the two?—With

14 to 16 candle gas, it is fairly constant; the 14-candle gas is slightly higher. It is practically constant up to about 18 candles.

In reply to the Chairman, Mr. TALBOT said that when the London Gas Bill was promoted, the standard illuminating power of the South Metropolitan Company's gas was 14 candles. It was tested with the No. 1 argand burner in a particular way, which gave more light from the gas than the manner which was proposed in the London Gas Bill using the same burner. The London County Council, the promoters of the Bill, in order to compensate for this, proposed to call it 13-candle gas instead of 14 candles. The Bill was contested by the Gas Companies; and the proposal to retain the No. 1 burner and call the gas 13 candles instead of 14 candles was done away with by the Committee of the House of Lords. The Committee agreed to the insertion of a clause giving the Gas Referees power to prescribe for testing the burner which must be the most suitable for affording the most light.

Mr. TALBOT (to witness): The effect of this Bill will be to allow these companies to supply the consumer with a different quality of gas to that which, in fact, he gets now?

Witness: Yes. I take the view that for many years the consumers have been getting rather more in the way of quality than Parliament formerly intended them to have. I think it is to the consumers' advantage, because it will tend to cheapen gas manufacture. I think the consumer has been suffering through getting a higher quality gas.

In re-examination by Mr. PADDON, witness said the whole of the objections to the Bill could be met by giving the consumer a new flat-flame burner. It would be perfectly easy to supply a new burner which, with a lower-grade gas, would give the same light.

Mr. Corbet Woodall's Evidence.

Mr. *Corbet Woodall*, the Governor of the Gaslight and Coke Company, was the next witness. He considered that the application of the Companies in the Bill was justified both in the interests of the consumers and of the public. The No. 2 test-burner was superior to any other. It was already in use by upwards of 80 gas undertakings, some of which were municipalities; and it was specified in the Model Bill. They had a clear right to have their commodity measured fairly and accurately. In London, the standard of illuminating power had been reduced from 16 to 14 candles; and the burner which was suitable in the old days was quite unsuitable now. His Company had made the concession that every company must make—that they would make the gas at a little less cost; but the result of it was that there was an earlier reduction in the price of gas than otherwise would have taken place. They agreed to a reduction in the standard price, not because the reduction in the illuminating power was too much, but in order to secure an unopposed Bill with the London County Council. With regard to the present Bill, he did not consider the adoption of the No. 2 burner was any ground at all for an alteration in the maximum or standard price. If there was an economy from the adoption of the burner, five-sixths of any benefit would go to the gas consumer. The adoption of the burner was an act of justice to the companies, inasmuch as from the year 1868 the principle had been recognized that the burner ought to be such as would develop the greatest amount of light. So far as he was aware, Parliament had only increased the price of gas on the adoption of the test-burner in one case—that of Brighton. The companies would reap some advantage from the change; and the advantage of having a standard that would make the working of the companies throughout the kingdom fairly comparable justified the application that was being made. At present, they had to keep the gas at a fictitious value by using enrichers. Any advantage that might be gained under the Bill must go to consumers under the regulations of the sliding-scale and maximum-price companies. These were competitive days; and every advantage that a company could have would help towards the reduction of the price of gas. The chief aim of gas companies was to get the price down so as to hold their own in the competition that had to be met. An alteration in the standard price would not necessarily mean any alteration at all in the selling price; but it would mean that the dividends of companies would be reduced in certain cases. It would merely affect the shareholders of standard-price companies, and would not touch the maximum-price companies. He was strongly opposed to alterations of the standard price. People buying stock at auction, purchased in regard to the standard price and the dividend. If the standard price were reduced, these people would be injured; and the changes had a tendency to affect the premium. If the proposed change were made in the burner, the consumer would get a better gas; and if there were any economy, he got the lion's share. His own feeling was that a calorific standard was inevitable in the near future; but it should be adopted generally by Public Act, and not filtered in by occasional Acts of this sort.

Cross-examined by Mr. RAM: When a gas company comes to Parliament for an advantage, in whatever way it may be, the practice of Parliament generally has been to see that the consumer gets some advantage coincident with, and corresponding to, the advantage gained by the company?

Witness: I think Parliament needs to be satisfied that the change proposed is not of a one-sided character.

The effect generally is, is it not, that if a company get an advantage they have to give some corresponding advantage, either by increasing the candle power or by reducing the price?—I do not think I can accept that. This same question has been before Parliament on so many occasions, and on none of them has there been any reduction of price required so far as I am aware.

If there is a financial advantage in this case, should the consumer participate in it?—Yes.

Replying to further questions, witness said the saving would not be considerable. Part of the saving, such as it was, the consumer would get in the case of the sliding-scale companies, and in the case of the maximum price companies they would get all of it. When the No. 2 burner was put on the Gaslight and Coke Company, the quality of the gas was maintained at 16 candles. They really got very little advantage indeed.

Mr. RAM quoted from the evidence previously given by witness, to the effect that if a 20-candle power gas were supplied giving a certain illuminating power, and for a 15-candle power gas the same price were charged, it followed that the person who wanted to get the same light must burn 25 per cent. more gas.

Witness replied that that was so, if the gas were burnt in a flat-flame burner; but he did not care to consider the flat-flame burner at all. It was, or ought to be, absolutely dead. For heating purposes, practically the same result would be obtained as they got now.

Witness was then asked with regard to a list of companies which had been placed before the Committee indicating the decisions of Parliament in previous cases; and he agreed that in some of these cases there was a reduction of price concurrently with the alteration of the burner. When a gas undertaking came to Parliament with a maximum price ridiculously high, it was lowered; but no reduction was practically given for the introduction of the argand No. 2 burner.

In re-examination by Mr. FITZGERALD, witness said there was no relation whatever between standard price and maximum price. In the case (say) of a company that had its maximum price fixed 40 years ago at 6s., and when it came to Parliament the price of gas had gone down to 2s. 6d. or 3s., almost as a matter of course the maximum price was reduced so as to have some fair relation to the actual selling price. If it happened that the maximum price was reduced in this way at the same time as the testing was authorized by the standard burner No. 2, the two things had no relation to each other. It was ridiculous to say that the maximum price was reduced from 6s. to the 2s. 6d. standard—the two things had no relation to each other at all. The consumer would get almost the whole of the benefit from the change in the burner. The arrangement as it stood was a perfectly reasonable one. Counsel having pointed out that it was said that the consumer would require to use more gas, witness replied there was no reason for such a statement. The consumers who continued to use antiquated burners would suffer; but anything that tended to compel them to give up the extravagant and adopt the economical was in their favour. In Germany, the municipalities and companies had ceased to test illuminating power altogether; and in over 90 per cent. of the gas that was used, the luminous value of the flame was of no importance.

Mr. Alex. Wilson's Evidence.

The next witness called was,

Mr. *Alexander Wilson*, the General Manager to the Glasgow Corporation gas undertaking. He said that in 1869 the gas supplied was of 25-candle power; but this had been reduced from time to time. In the present session, the Corporation had in Parliament a Bill, which had passed through Committees of both Houses, under which the illuminating power had been reduced to 14 candles; and the standard burner to be applied was the "Metropolitan" argand No. 2. They adopted this burner in 1907; and since that time there had been no increase in the consumption above the normal increase of previous years. The use of incandescent burners was rapidly extending with them. The Corporation had had no complaints from consumers with regard to their gas-engines, owing either to the adoption of the standard burner or the reduction of the illuminating power.

In reply to Mr. RAM, witness said the profits from the gas undertaking were applied in the reduction of the price of gas. He agreed that there had been an increase in the use of electricity.

Mr. FITZGERALD: If no convenience of any sort has been found with the gas-engines in Glasgow, it is not likely that the gas-engines in any other town will be the worse for it?

Witness: I do not expect there will be any difference.

Wednesday, July 6.

When the Committee met this morning,

The CHAIRMAN announced that the No. 1 burner was admitted to be defective except as regarded 16-candle gas; and it was abandoned for that reason. The No. 2 burner cured these defects. The No. 1 burner untruly registered gas of under 16 candles, which was an injustice to the companies. The point was that the No. 2 burner admittedly accurately and truly registered not only 16-candle gas, but gas of any quality below that, and any quality up to 20 candles. The Committee did not require a repetition of that evidence.

Mr. H. E. Jones's Evidence.

Mr. *H. E. Jones* was then called. He said that some of the petitioners were apprehensive that the adoption of the No. 2 burner would put some extra cost upon them. Most of the companies with which he was connected were sliding-scale companies. They were supplying gas cheaply and paying high dividends; and all of them had obtained the use of the No. 2 burner. It was not true the consumer would burn more gas; it was not so in the history of the companies who had adopted the burner. In no case had there been an increase in the total sale of gas. If the contention of the opponents was right—that by the adoption of the burner more gas would have to be burnt—these companies must account for it; they could not conceal their records. He had knowledge of companies outside London; and his experience was that by the adoption of the No. 2 burner the consumer would not be prejudiced in the slightest. He would be benefited.

The CHAIRMAN: The apprehension has been expressed that the poor man would be compelled, in order to get the same light, to use a larger quantity of gas, which would put him to great expense. The Committee would like to see that it would not injure the poor consumer.

Witness replied that his Company had a large percentage of working men consumers—something like 75 per cent. In their case there had been no increase since the adoption of the No. 2 burner, which was adopted in 1905. He quite agreed with Mr. Carpenter's evidence in this respect. The flat-flame burner never did give the full value of the gas. There was a difference of 5 or 6 candles between the argand and the flat-flame burner; so that the difference really was negligible. The suggestion had been made that, owing to the adoption of the standard burner, there would be some considerable change in the calorific value of the gas. His experience was that the difference between 14 and 16 candles was only ¾ per cent. for each candle. A difference of 1½ per cent. would be absolutely negligible for all practical purposes. There were much heavier losses than that in the apparatus for cooking and heating purposes. With regard to the list of companies which had been referred to, the details there given did not necessarily mean that an alteration of standard price or standard dividend was in connection with the changing of the burner.

The CHAIRMAN: There is no case in which compensation was given for the mere substitution of the correct burner for the incorrect one?

Witness: That is so.

Mr. MUNROE: With regard to Hastings, supposing Parliament allows this change of burner, you say that the gas consumer will be in no way prejudiced?

Witness: In no way whatever. He will be benefited.

Supposing you have gas which, measured through Sugg's No. 1 burner, shows 15 candles, and you pass that gas through the No. 2 burner, I suggest that it will show something near 10 or 11 candles?—A 15-candle gas by the No. 1 burner might show 16 candles in the No. 2 burner.

Your candle power to-day is 15 candles; and if gas is passed through the No. 2 burner, it shows about 18 candles?—That is my experience.

Mr. RAM pointed out, in reply to a question by the Chairman, that the consumer was now entitled to a certain candle power gas. Now the gas companies said the test-burner had not been wholly accurate, and had caused them to supply a somewhat better gas, because it had failed to show the full candle power of the gas supplied. The crucial point was that if the Committee found on the evidence that the No. 2 was a better burner, and one that was more just to the companies and would enable them to show a true test, let them have the burner under the conditions that it was not denied that it would confer a considerable amount of benefit on them. The question was, Would the advantage conferred upon the companies be greater than the mere removal of the injustice? It was perfectly certain that gas of an inferior quality would be supplied to the consumer; and the point was whether the consumer ought not to receive some consideration in regard to this. They would obtain a less good article than they were getting to-day. They would have to use more gas to obtain the same light; and if they used more, they would have to pay more.

The CHAIRMAN: Do you mean to suggest that Parliament, in prescribing the test, did not intend it to be a true and accurate one?

Mr. RAM: It is because we think Parliament did intend it to be a true and accurate test that we are saying that, inasmuch as it is a truer test, let them have it; but let the consumer be compensated.

Mr. FITZGERALD: The consumer will get what Parliament intended him to get—namely, the exact illuminating power which was mentioned in the Act.

The CHAIRMAN: Will the consumer by this burner get really 14 candles?

Witness: He certainly will.

And he will not pay anything more for it?—No.

Mr. MUNROE: Do you suggest that if this burner is allowed, we shall get exactly the same article we have been getting before?

Witness: No.

And is not the article we have been having prescribed by Act of Parliament?—It is a very faulty prescription.

And the actual price named in the Statute is to remain the same?—Yes.

Supposing by this burner there is a reduction of 5 candles. If a candle power is worth 1d., the Hastings Gas Company will save £9300 a year on the present consumption. Into whose pocket is this saving going?—Into the consumers' pockets.

But there is nothing in the Bill to divert the £9000 into the consumers' pockets?—There is the sliding-scale.

Apart from this saving, it will cost less to produce the gas which will pass the test of the No. 2 burner?—It will cost perhaps 1½d. or 1d. less per 1000 cubic feet.

Do you suggest that for the purposes of heating, cooking, and motive power, the gas tested under the No. 2 burner is equally as good?—Practically as good. It is as good for all common-sense purposes.

I put it to you there is a difference of 12 per cent.?—Certainly not. It is not ½ per cent.

In reply to Mr. FITZGERALD, witness said that, assuming an economy was to be effected in the manufacture of gas, five-sixths of it would go into the consumers' pocket under the sliding-scale. They could not, under the sliding-scale, increase the company's dividend without first decreasing the price to the consumer.

Concluding Evidence for the Promoters.

Mr. *William Cash* placed before the Committee a table relating to the financial position of the companies under the Bill; and remarked that four of them were sliding-scale companies and four maximum-price companies.

Mr. *W. C. Young*, Gas Examiner to the London Corporation, said his experience was that the change in the burner would not necessitate the burning of any more gas by the consumer for common purposes. He was also the Gas Examiner to the Hastings Corporation; and with regard to the tests which had been referred to as having been taken there, he said that they had no value whatever. It was impossible with the apparatus at Hastings to make a test with the No. 2 burner in conformity with the proposals of the Bill. The substitution of the No. 2 burner would be entirely to the advantage of the consumers of Hastings. The Gas Referees were of opinion that the flat-flame burner was worn out after it had been used for six hours. The difference in the use of the standard burner would be from 1 to 1½ candles. The light which the consumer obtained from the flat-flame burner was considerably less than that which the Company had to supply under their Act. When the Company were supplying 15 candles, the flat-flame consumer would be getting about 9½ candles. The difference of 1 or 1½ candles was a negligible quantity.

Mr. *Charles E. Botley*, the Engineer and General Manager of the Hastings and St. Leonards Gas Company, agreed with the evidence given by Mr. Jones. Of any economy that might result, £80 out of every £100 would go to the consumer. If, on the substitution being made, they changed the flat-flame burner for a new one, it would make up to the consumer any loss, negligible or otherwise, that might be brought about.

Mr. *Robert Beynon*, the General Manager of the Torquay Gas Company, gave similar evidence.

Mr. FITZGERALD announced that this would be the case for the Bill. The Torquay Corporation were no longer opposing the Bill at present, although they might appear later on.

The Case for the Opposition.

Mr. RAM then proceeded to call his evidence in support of the case for the Hastings Corporation.

Mr. *Thomas S. Berry* (of Messrs. Sherwood and Co., Parliamentary Agents) gave evidence in proof of a table containing the details of a large number of companies indicating the course which Parliament had taken in previous cases. He said it was a matter of inference whether Parliament had made any alteration of price in consequence of the change in the burner.

Mr. *B. F. Meadows*, the Town Clerk of Hastings, said his Corporation opposed the Bill as the result of a conference of the local authorities. The view of the conference was that they would get an inferior quality gas, a less illuminating power, and a lower calorific value. The price charged in Hastings was 2s. 10½d. per 1000 cubic feet; and the Corporation's consumption amounted to £6000 a year.

Mr. HONORATUS LLOYD: It is the natural corollary if, as a matter of fact, we are agreed that the old burner has registered inaccurately against the Company, the result is that the Company has had to go to unnecessary expense to produce an article which Parliament never intended the consumer to have?

Witness: I agree.

And if this Bill is passed, the unnecessary cost which Parliament never intended should be expended will be saved?—Yes.

Continuing, witness said that wherever the Corporation had electric mains they were converting the gas lighting into electric lighting. They were gradually extinguishing gas for public lighting and substituting electricity. The undertaking did not pay in the sense that local authorities were handicapped when they were in competition with companies, because they had to make large provision for the sinking fund. From this point of view it did not pay.

Mr. *A. G. Smith*, the Gas Examiner engaged by the Liverpool Corporation, said that, in connection with the general case of all the authorities, he went to different towns in the country making experiments with the gas. On March 22, he tested the Hastings gas. With the No. 1 burner, the illuminating power was 15·28 candles; and the same gas tested five minutes afterwards with the No. 2 burner showed 18·44-candle power. There was a difference of 3·16 candles.

Mr. HONORATUS LLOYD: Could you tell me whether the present burner used at Hastings measured accurately?

Witness: I think so.

Do you also say that the proposed burner is an accurate one for Hastings?—Yes.

How is it that two accurate burners testing the same gas produce different results?—One has an adjustable air supply.

Yes, that is just the difference. The accurate one is the one we propose to adopt?—My contention is that the accurate burner, so-called, will enable the companies to send out a lesser quality of gas.

Is the proposed burner accurate?—It increases the luminosity.

Are you in favour of the new burner being adopted?—I am to a certain extent.

Are you generally in favour of its being adopted?—I suppose it would be a good burner; but it would not be applicable to Liverpool.

Professor Frankland's Evidence.

Professor *P. F. Frankland*, Professor of Chemistry at the Birmingham University, said he had devoted special attention to the composition of the illuminating power of gas. It was advantageous to the consumer to have a gas of high illuminating power; and the effect of the Bill would be to enable the companies to send out gas of less illuminating power than they were at present supplying. It would be labelled as a gas of the same candle power; but it would be of inferior quality. The whole question depended upon the burner in which the gas was burnt, and the rate of consumption. By altering these two things, they could make a gas of a very different candle power. It was cheaper to manufacture gas of a lower than a higher illuminating power. The Bill would enable the companies to supply at the same price an article which would be less advantageous to the consumer, and which would cost less to the gas manufacturer to produce. If the consumer wished to have the same illuminating power, he would undoubtedly have to burn more gas. He had made experiments with the Liverpool gas; and the flat-flame burner, which was the standard for Liverpool, gave an illuminating power of 14·1 candles. With the No. 1 "Metropolitan" argand it gave 16·3 candles, and with the No. 2 "Metropolitan" argand 19·1 candles. If the companies had been coming to Parliament to alter the 15 candles to 12, the result would be precisely the same as they were now proposing; and they must have given a concession to the consumer from the point of view of price. There was no exact ratio between the calorific power and the illuminating power of gas, except where they were dealing with one kind of gas. If the gas was of a different character altogether, with a higher illuminating power, the calorific value would not follow at all.

In reply to Mr. HONORATUS LLOYD, witness said he did not know whether the gas he tested at Liverpool was the Corporation gas—the ordinary gas that they supplied. Asked what candle power he was in favour of, he said the higher it was the better. He knew that the whole course of Legislature for some years has been to reduce it. He considered that both Parliament and the Board of Trade were making a mistake. Parliament had been steadily favouring the manufacturer. He had no fault to find with the proposed new burner from the point of view of accuracy. For the purposes of commercial contracts, his view was that the existing burner was preferable to the new one. The No. 2 burner would give the maximum illuminating power of any gas better than the No. 1 burner; and he agreed that it was the best burner if it was handled skilfully and honestly.

Replying to Mr. TALBOT, witness said there was no such thing as 14 or 15 candle power. Whether a particular gas showed that light depended on the burner and the rate of consumption.

Mr. Isaac Carr's Evidence.

Mr. *Isaac Carr*, the Manager of the Widnes Corporation Gas-Works, said the gas supplied by them was at a lower price than that of any

other town. They charged 1s. 2d. per 1000 cubic feet to small consumers, 1s. to consumers of 3 million cubic feet per annum, and 10d. to all users of gas for motive power. No attempt, however, had been made to reduce the illuminating power; and he was of opinion that such a reduction was equivalent to an increase in price. He had made experiments to determine the relation of the difference in photometrical value between one test burner and another; and he found that 14-candle gas as tested in the 15-hole Sugg-Letheby argand was returned at over 20 candles when tested in the No. 2 "Metropolitan" argand. Gas of 14 candles tested in the "Metropolitan" No. 2 argand gave a result of 8 candles in the Sugg-Letheby argand. There was no such thing in the abstract as candle power. His Corporation had a Bill in Parliament in 1908 seeking additional powers; but there was no attempt to reduce the illuminating power or interfere with the statutory method of testing. The standard remained at 14 candles as tested with the Sugg-Letheby argand, with 15 holes and a 7-inch chimney. Since then, there had been various new argand test-burners invented in order to appreciate the photometrical value of gas. The gas passed through them looked as though it were of a better quality when passed through some other burner. In testing the Widnes gas (which was kept as constant as possible in quality), it might be made, according to the burner screwed on to the photometer, 14, 16, 17, 18, 20, or 22 candle power. The standard 14-candle gas in the Sugg-Letheby burner was shown in the No. 2 "Metropolitan" argand as 19 and 20 candles. It was made to appear much stronger in one burner and much weaker in another. He produced a number of burners, and said the same gas put through them showed a different result in every case. He held a high opinion of the No. 2 burner until he heard Mr. Carpenter say, before the other inquiry, that he could obtain a good result, or a result, from a non-luminous gas. He told the Committee in the other House that, by testing methane (which was practically a non-luminous gas) in this particular burner, he could obtain a light. Up to that moment he (witness) thought it was a good burner; but he then set to work to consider how that came about, and his views had undergone considerable change. He had taken a quality of gas which registered in the "London" argand burner, the burner under consideration, 15·7 candles, and the same gas tested in the proposed manner registered 19·7 candles, and in the standard batswing burner 12 candles. He mixed the gas with 6 per cent. of air—and, of course, a very small percentage of air destroyed the luminosity of the gas very rapidly. The result on the No. 1 burner was to drop the illuminating power from 15·7 to 14·8 candles; and on the No. 2 "Metropolitan" burner, it dropped from 19·7 to 18·3 candles. He then put more air into the gas and rendered it almost non-luminous. When there was 40 per cent. of air put in it, it registered 1½ candles in the flat-flame burner and 5½ candles in the No. 1 burner, but with the very extraordinary result that in the No. 2 burner it indicated 13 candles. It was a matter of surprise to him that a gas which was down to practically non-luminous gas in the flat-flame burner could give such an excellent result. His explanation of it was that the air necessary for combustion could with this burner be put into the gas at the gas-works and sent along through the mains, and, by closing down the damper more than would be required for a proportion of pure gas, so bring about the result. With one burner there was no means of restricting the air supply, and the same accurate result was obtained; but with the burner in which they could manipulate the air supply—air that must be had for combustion, and whether it was in the gas, or whether it came from the air, did not appear to be of great importance—it was possible to get this excellent result, which he obtained by shutting the damper down more and retarding the inflow of the air necessary for combustion, because there was a large proportion of air mixed with the gas. In the other House, he had said he regarded it as a suitable burner for testing purposes; but what Mr. Carpenter said about the effect of getting light from some non-luminous gas had led him to change his views, and, in consequence of his recent investigations, he no longer regarded it in the same light. It was capable, of course, of fair and proper treatment.

The CHAIRMAN: Do you mean that it could be improperly used?

Witness: Yes; it is capable of most improper use.

At the will of the tester?—At the will of the gas maker. It very frequently happens in the process of gas making that an excess of air may get into the gas, which would immediately be detected in the older burner; but it would not be detected in the proposed burner, because the operator, in making the test, would admit less air to the burner in consequence of the air contained in the gas.

In other words, you think that the gas companies might fraudulently defeat the test?—I do. I say this opens up a possibility that I never dreamed of until this matter came forward.

The last witness told us that there was no such thing as 14 or any number of candle power gas. How did the expression "so many candle power gas" first arise? It must have been for a real comparison of the light of gas with the light furnished by so many sperm candles?—That is so.

And the light given by them is a quantitative reality?—Yes; and I think that was very clearly explained by Professor Frankland. Supposing we dismiss the sperm candles, and take the pentane standard of 10 candles. What is the light emitted from a lamp known as the pentane lamp, which gives a constant light of 10 candles and which is universally accepted as the standard of light? It gives a result equal to 10 candles—a constant 10-candle standard. Taking this pentane lamp test, and testing with the pentane standard any constant gas—say, the Widnes gas—gives these different results. If you come along to test my gas, I say: "Do you want 14, 16, 17, 18, 20, or 22 candles?;" and I screw on the burner which will give you the result that you require, or that I say I want you to have.

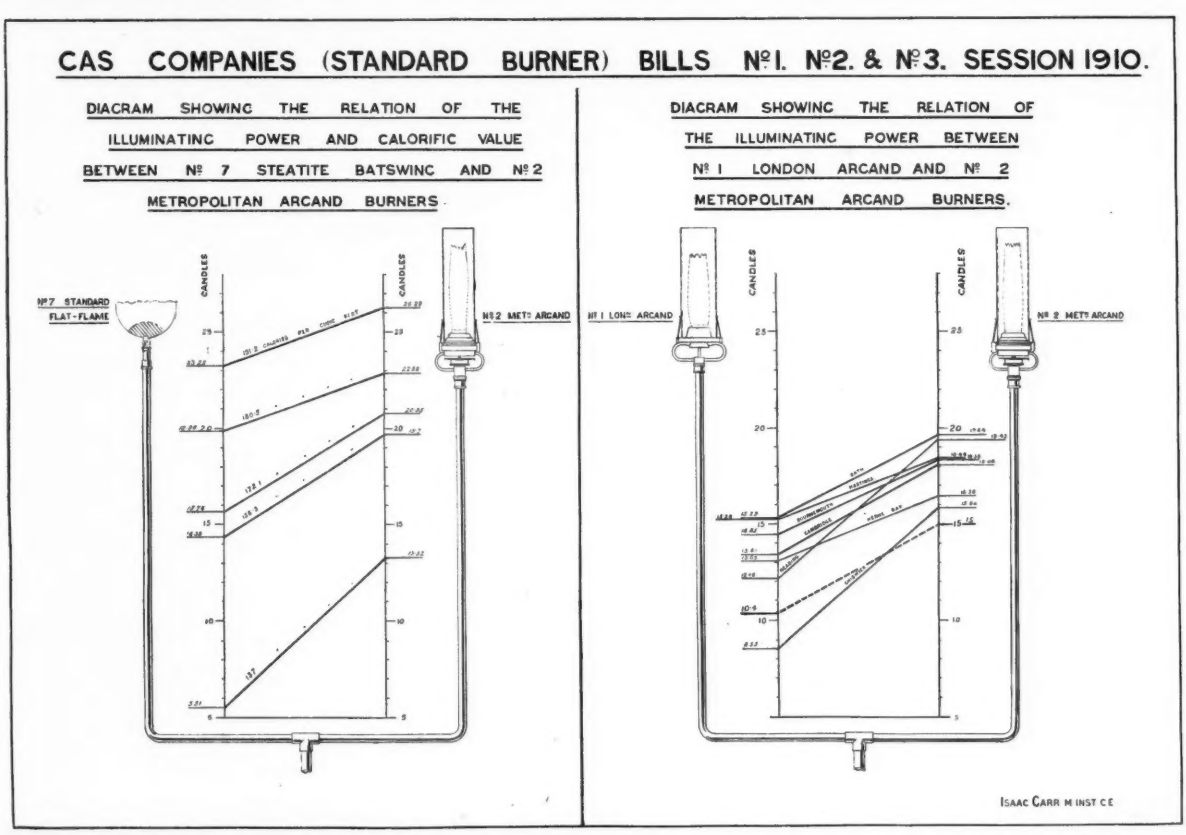
If by the pentane burner, which shows a light of 10 candles, you want to ascertain 14, there must be another step. Is that adjusted by a photometer?—It is simply the multiple that is changed.

I suppose there is such a thing as a really accurate 14-candle power light?—That depends entirely on the burner used. That is to say, with the Sugg-Letheby burner you get a light equal to 14 candles; but the same gas in this burner gives a light equal to 20 candles. So that the light depends on the burner. If you were to screw on an incandescent burner, you could get the light very much larger—exaggerated still further. But I am speaking now of the ordinary test burners that are made statutory; and there is this range between the existing statutory burners of 14 to 20 candles.

Mr. RAM: How is the light created in the pentane lamp?

Witness: It is an atmospheric gas.

That requires no burner to make it 10 or 12, or anything else?—No. It is measured through a screen. You can vary the height of the flame; but you cannot vary the opening through which the light is emitted from the burner. When the instrument comes to you from the makers, as passed by the Metropolitan Gas Referees, there is a


GAS COMPANIES (STANDARD BURNER) BILLS Nº1. Nº2. & Nº3. SESSION 1910.
DIAGRAM SHOWING THE RELATION OF THE ILLUMINATING POWER AND CALORIFIC VALUE BETWEEN Nº 7 STEATITE BATSWING AND Nº 2 METROPOLITAN ARCAND BURNERS.
DIAGRAM SHOWING THE RELATION OF THE ILLUMINATING POWER BETWEEN Nº 1 LONDON ARCAND AND Nº 2 METROPOLITAN ARCAND BURNERS.
CANDLES
Nº7 STANDARD FLAT-FLAME
Nº2 METR. ARCAND
Nº 1 LOND. ARCAND
ISAAC CARR M INST C E

*** The dotted line in the right-hand diagram shows the observations made by Mr. Carr at the offices of the London County Council, 40, Craven Street, Strand, on the 7th inst.

measured point which the flame must be lifted to, and there is a measured opening in the partition through which the 10-candle portion of the light is emitted on to the testing disc; so that if you conform to the instructions, you get a 10-candle light.

The CHAIRMAN: Now the question is, as between the two burners, which is the better one for the purpose of proving this actual 14-candle power light?

Witness: When the question of the Widnes Corporation coming to Parliament was under consideration two years ago, I advised my Committee that I understood the relationship between standard test burners. I said: "It is quite unnecessary for us to apply for powers to adopt the No. 2 'Metropolitan' burner," because we could have done two things. We could either have called our gas 20 candles, re-christened it, and, instead of calling it 14 candles with the existing burner, we could have gone on supplying the same quality gas and have said we were supplying 20 candles. Or we could have done this, which the promoters are seeking to do—we could have supplied 14-candle gas in this burner, which would have meant a reduction of nearly half the illuminating power. We should have supplied a very inferior quality of gas, and we should have got into all sorts of difficulties.

Mr. HONORATUS LLOYD: Which nobody else has.

Witness went on to say he was dealing with 14 candles, compared with what they were now supplying in Widnes. There would have been all sorts of difficulties; and he advised the Corporation that no attempt be made to obtain a lowering of the quality of the gas.

Mr. RAM: Supposing a gas company comes along to you and says: "I have got some gas and I am bound to supply it to a customer of mine at 14-candle power," what burner would you tell him to put on that gas to do it?

Witness: In my case, the statutory burner is the Sugg-Letheby 14-candle burner.

If you take the same gas and apply the "Metropolitan" No. 2 burner, will it still give 14 candles?—No; it would give between 19 and 20 candles.

Thursday, July 7.

Mr. *Carr* continued his evidence in chief this morning. He said he had prepared a table showing the result of a series of tests which he had made with nine different burners, using a portion of the same bulk of gas through each one. The gas was stored so that it could undergo no change, and so that the relation of the photometric value between the different burners might be accurately ascertained. In the Sugg-Letheby burner, the gas came out at 14·2 candles; in the flat-flame standard No. 7, at 14·7; in the "London" No. 1 argand, at 16·2; and in the "Metropolitan" No. 2, at 20·30. Having regard to these results, he thought the difference of 3·16 candles found by Mr. Smith in the Hastings gas was probable, and he believed it might be even greater. The Hastings test was made at a 15-candle rate; and this was the reason that such an excellent result was obtained in the No. 1 burner. A 10-candle power gas through the No. 2 burner would be 15 candles; and the less the number of candles, the greater would be the difference. The Widnes Corporation could have had the No. 2 burner for the asking; but the gas they supplied would have been reduced to between 8 or 9 candles—a most inferior article. It was a fallacy and an unfair argument that any change in the quality of the gas would not adversely affect a consumer with a bad burner. The promoters contended that if a consumer had a flat-flame burner and a good gas, with a low-grade gas and a good burner he would not feel the difference. They must give a man credit for burning his gas properly. He had made experiments at the Liverpool Corporation Gas-Works, having regard to the substitution of the No. 2 burner for the No. 7 flat-flame burner (which was the Liverpool test-burner); and he found that with the 20-candle power gas there would be a saving, having regard to the purchase of raw materials, improved coke, and so on, of 4·8d. per 1000 cubic feet. The saving to the Liverpool Gas Company was not quite on all-fours, however, with that of the Liverpool Corporation. But if he was right that the saving was 5 candles, then there was a saving in the cost of production of 4·8d. He had also prepared a table showing the reduction in the illuminating power and the reduction of calorific power, with regard to both flat-flame and incandescent lighting. He found a reduction of 5 candles on the 16-candle power gas, which meant that, in order to obtain the same light, the consumer would have to spend 7½d. per 1000 cubic feet more. All the flat-flame consumers using gas for heating, cooking, and motive power would be adversely affected. Where a gas-engine was working at its maximum, with the change that was proposed it would be no longer capable of doing the work it was now doing. With other engines working within their maximum pressure, they would get over the difficulty by using more gas. The company got the benefit of this and the consumer lost it; or unless there was some benefit to the consumer, the benefit would go to the company. The ratio between the flat-flame lighting and the incandescent lighting was different—there was an actual loss in the incandescent lighting of 2 per cent. per candle, and in the case of the flat flame it was very much more.

With regard to the opposition to the Bill, he said that some of it had disappeared. In the case of Ipswich, the Company had given a reduction in the selling price; and on account of this, the Corporation had withdrawn their opposition. Ilford had vanished for the same reason. The Brentford Company had withdrawn from the Bill; and in the case of Richmond, a clause had been inserted that the Act was not to apply to them without the consent of the Corporation. All incandescent gas-burners were of the same type; and the consumers would have to use a larger quantity of gas in order to obtain the same light when the gas was of a lower quality. Referring again to the Richmond case, he said he would be willing to take a similar clause to the one that had been given there.

Mr. HONORATUS LLOYD: Do you approve of the No. 2 burner?

Witness: No.

Did you approve of it when you were in the other House?—Yes.

And you changed your mind because Mr. Carpenter explained that with a non-illuminating gas some candle power might be shown with the No. 2 burner?—Yes.

What was the non-illuminating gas to which Mr. Carpenter alluded?—I believe it was methane.

Have you measured methane with a flat-flame burner?—No.

Do you know that it shows luminosity?—I believe it does.

Then you would condemn the flat-flame burner?—If I was obliged to have a light from such a gas with a flat-flame burner, I would say it was an unsuitable burner.

Why do you condemn the No. 2 burner because it shows that which the flat-flame burner shows, and not condemn the flat-flame burner—There are conditions which I have already explained.

You would not condemn a burner because it showed a degree luminosity with a non-luminous gas?—That would depend on circumstances.

You have made experiments with the No. 2 burner with a non-luminous gas?—Practically non-luminous.

Have you made the same experiments with the flat-flame burner with the same gas?—Yes.

What gas are you now describing as non-luminous?—A coal gas mixed with 40 per cent. of air.

And what luminosity did you get?—1½ candles with the flat-flame burner, and 13 candles with the No. 2.

Replying to further questions, witness agreed with what he said in the other House that, with a lower-grade gas, the "Metropolitan" No. 2 was the best testing burner invented. In the other House, he also said: "I say the burner is excellent. It is the best burner up to this time which was ever invented, in my judgment." He said he was referring then to a statutory burner.

Mr. HONORATUS LLOYD: Do you agree that Parliament intended from time to time to prescribe a burner which would measure the maximum amount of light?

Witness: My view of what Parliament intended in Gas Bills differs from yours. I cannot answer your question in the way you put it, for the reason that I hold the view that the whole legislation in gas matters has been that, whatever gas companies have required ever since I can remember, they have succeeded in getting. Whenever an improved burner, improved standard, or improved device of any kind has been in favour of the gas companies, it has been made statutory, and the whole legislation been dominated by the gas companies.

Do you suggest there is a difference between companies and local authorities in this respect?—The companies have taken the lead, and some local authorities have followed.

Do you suggest that Parliament did not understand?—That is what I feel at the present time. The matter has never been understood, and it is not understood now.

Will you assist us with your conclusion of what Parliament intended?—In my opinion, Parliament has acted in the best interests, from the cases that have been put before them, of the companies and the consumers.

Even assuming that Parliament has been mistaken from beginning to end, what is their mistaken view? Was it that they intended to prescribe a burner which would measure the greatest amount of light?—I say that what Parliament understood in granting these powers to the various companies was that whatever the company could do in the photometer room, the consumer should be reasonably able to do in his house.

In further cross-examination, witness said he heard that the burner might be made for 5s., and Mr. Carpenter had said that it could be made for 1s.; and he agreed that it was capable of practical use. The burner was capable of admitting a large proportion of air, which would be prejudicial to the consumer.

Mr. HONORATUS LLOYD: You mean to say it is capable of regulation so as to provide the proper amount of air for showing the maximum amount of light?

Witness: Yes.

Do you suggest that Parliament through all these years has intended, when it has said *x* candle power shall be given, that it meant one thing in Newcastle and a different thing in the Isle of Wight?—Yes.

When Parliament prescribed 16-candle power in Northumberland and 16-candle power in Cornwall, do you suppose they intended to prescribe two different things?—I can only tell you that if they prescribed 16-candle gas in two different towns, the effect was that they were two different qualities of gas.

Replying to further questions, witness said at Widnes the candle power was 14 in the prescribed burner—the Sugg-Letheby. The gas varied at different times of the day. They enriched with cannel and benzol.

Mr. HONORATUS LLOYD: Which chiefly?

Witness: It depends upon circumstances and upon the material available.

Let us assume that it is about equal. Is it the fact that benzol has the effect of raising the candle power for a short time so as to enable it to pass the test, and when it gets outside to the pipes it drops?—That depends upon the circumstances.

The severer the weather, the more benzol you have to use in order to pass the test?—Yes.

And the effect wears off still?—In proportion; it does not all wear off.

The further the distance from the measuring instrument the worse gas the consumer gets?—Yes.

Do you enrich it in the evenings?—Yes.

And you do that to produce a higher-grade gas for lighting purposes?—Yes.

Because you know perfectly well that the lower-grade gas is better for power?—No.

Then why do you not enrich it in the daytime?—We do.

Then why do you further enrich it in the evening?—Because we find it desirable, having regard to the large number of flat-flame burners in the town. We give gas in excess of our statutory obligation in the daytime and in the evenings.

Mr. HONORATUS LLOYD then called attention to the evidence given by Mr. Carr before Lord Rayleigh's Committee; and he mentioned the divergence in the results of the tests which had been given by Mr. Carr, as compared with the figures of Mr. King, who was a member of the Committee.

Witness, in explanation of this, said that Mr. King was the Manager of the Liverpool Gas-Works, which were three miles from Widnes, and they were producing gas at two to three times the cost at which it was

being produced in Widnes. It was quite true the candle power in Liverpool was high. Frequent reference was made to the comparison of the cost of manufacture in Widnes and the selling price in Widnes and Liverpool; and Mr. King set up hostile tests to disgrace him in the matter of illuminating power. For a long period of years Mr. King kept a secret testing-station in the town of Widnes; but where the testing-station was, what burner he used, or the conditions under which the tests were made, he never knew or understood. He only knew that, because of his jealousy, Mr. King was seeking to account for the enormous difference in his works and those of Widnes. There was a difference of 2 candles between Mr. King's tests and his; but for hostile tests he did not think that was very extraordinary. Two years ago, Widnes considered coming to Parliament; and they could have had the new burner for the asking. But his advice was that it would be a mistake to substitute the No. 2 burner, because it would have resulted in their giving gas of about half the quality they were now supplying, and would have prejudiced the best interests of the Gas Department. He did not object to 18-candle gas in the No. 2 burner, but below this it would be a mistake.

Mr. HONORATUS LLOYD: Do you say that gas of high illuminating power is the right gas to supply to-day?

Witness: I do not agree with excessive enrichment. It depends on the quality and what you call high illuminating power.

What do you say is the best candle power?—I say that the candle power depends upon the raw material at the disposal of the various gas authorities throughout the kingdom. I do not believe any injury would be done by lowering the candle power in Liverpool provided that it is lowered on proper terms. The lowering of the candle power would enable the Company to effect a very considerable saving in the process of manufacture. The consumer would have to use more gas to get the result he is obtaining to-day; and if the Liverpool consumer were met by a reduction in the price of gas, I see no reason why the No. 2 "Metropolitan" burner should not be substituted for the No. 7 batswing, which would be equal to a reduction of five candles. I do not suggest or recommend excessive enrichment.

Do you agree with Professor Frankland with regard to illuminating power—"the higher the better"?—No.

In answer to Mr. MUNROE, witness said the No. 2 "Metropolitan" burner had been recently introduced in Dublin; and he was informed that there were a very large number of complaints resulting from the quick drop in the candle power of the gas. In London, the drop had been very gradual, and had not been felt as in the case of Dublin.

Mr. J. G. Newbigging's Evidence.

Mr. *J. G. Newbigging*, the Chief Engineer and Manager of the Manchester Corporation gas undertaking, said there was no provision in the Bill to ensure that the consumer would participate in any saving that might be effected by the use of the No. 2 burner. He had made experiments with a view of showing what the effect of the use of the No. 2 burner as a standard test burner would be on the consumers who used the incandescent mantle or the flat-flame burner, and also with regard to heating, cooking, and motive power. In the majority of towns in the United Kingdom, at least 20 per cent. of the gas for lighting was consumed in the flat-flame burner. They were generally used in the poorer class houses and manufactories, and where there was a good deal of vibration—in places where the incandescent mantle would not be suitable. There were various forms of flat-flame burner in use; but he thought the one most commonly used was the No. 7 standard.

The actual effect of the proposed change would be to enable the companies to send out a much poorer gas and still conform to the prescribed illuminating power. Provided the consumers were not to be injured in any way, it was advisable to have a common standard for testing gas. But if the companies were allowed to use the No. 2 argand, they would have a considerable advantage, and there was no provision to give a compensatory equivalent to the consumers. This was a one-sided bargain, and did not do justice to the consumers. The company was secured by its Act to save a considerable amount of money; whereas the consumers were not so safeguarded. It would depend upon the will of the company whether they would get any of the saving. He did not agree with the case put forward by the promoters, that in using the present burner they were placed at a disadvantage because a certain amount of light was not shown in it. There had been a great many fallacies introduced into the case for the Bill. It was not true that in testing with the No. 1 burner the light was destroyed. That was not the way to put it; it was misleading. The burner failed to register the illuminating power; but it went forward to the consumer, and the consumer got the benefit of that quality.

The CHAIRMAN: He gets the benefit of the advantage of the instrument?

Witness: Oh, no. He pays for what he is getting. He pays the whole of the cost—the cost of manufacture, the cost of distributing it, he pays the dividend of the company, and every charge—and he is entitled to the whole saving. The burner fails to register; but when he gets what is passed through the burner, he gets what he is entitled to under the Act.

Mr. RAM: The consumer only gets what he is entitled to, and therefore he does not get any advantage by reason of the fact that the companies are put at a disadvantage?

Witness: That is so.

We say there is a considerable loss to the consumer; but the promoters say the consumer will get the benefit, because the producer will be able to make the gas more cheaply, and ultimately the price will be reduced. Is it the fact that in all cases the consumer must get such advantage?—No; I do not think he necessarily gets an advantage. The money saved may be expended in various directions; and if the companies are allowed to use this burner without some restriction, it is putting a premium on decreased efficiency of management.

The CHAIRMAN: Supposing they have saved by cost of production and cost of supply. How do you say that may lead to diminished efficiency?

Witness: They will have a greater balance in hand to deal with, and they will not keep up to the high state of management which should exist. They may form superannuation funds, and so on,

But only so far as the law allows them?—They may expend money in experiments on the works. They may spend money on the works which ought to go to capital, and all that sort of thing.

That comes under the head of diminished efficiency?—No.

Mr. RAM: They would have less incentive to be as good as they could be in their working?

Witness: Yes.

But apart from this, could they raise the salary of every one of their employees?—Yes.

And the directors, too?—Yes.

Continuing, witness said that with regard to sliding-scale companies the promoters suggested that any money saved by the use of the burner would accrue to the consumer, and that whenever the dividend went up the price had to go down. But he would point out that before the sum was large enough to amount to any appreciable figure by which the dividend could be increased or the price lowered, there would be a considerable accretion to the Company. When the burner was first introduced five years ago, he made experiments in Manchester to discover the effect on the consumer. Manchester was under no restrictions for testing, and they were quite at liberty to distribute whatever gas they thought was best for the consumer. Their guide in manufacture in Manchester was by the calorific standard, because the bulk of the gas was for heating purposes. They saved a considerable sum, which had been given in one form or another to the consumers or the ratepayers.

The Hastings Gas Company, using carburetted water gas for enrichment, would be enabled by the change of burner to save at least ½d. per candle of reduction in the illuminating power. The difference, according to the tests that had been made by Mr. Smith, was a little over 3 candles; but it was quite possible, by manipulating the mixing of carburetted water gas and coal gas, to make a gas of 10 or 11 candles in the No. 1 burner show as 15 candles in the No. 2 burner. But with 3 candles it was a reduction of 20 per cent. in the illuminating power. The extra cost to the consumer in using this gas would be 7·2d. per 1000 cubic feet; for heating, cooking, and motive power, it would be 3¼d.; and for incandescent lighting, just over 2d. At ¾d. per candle, the saving to the Hastings Gas Company would be £4197 per annum on the present consumption; and in the case of Torquay, it would be £1629. But if they only saved ½d. on their production, it would work out at £2798 a year.

Mr. HONORATUS LLOYD: In Manchester, you endeavour to carry on the business so as to give the consumer the benefit of any economical management there might be?

Witness: The consumer and the ratepayer.

Largely the ratepayer?—No.

But, as a matter of fact, you take out of the net profits of the gas undertaking £50,000, £60,000, and £70,000 a year, and distribute it to the ratepayers?—The consumer and the ratepayer are practically one and the same person.

Have you constantly and consistently advocated that the profits of the Corporation gas undertaking ought not to be distributed in reduction of the rates?—Yes, because, of course, every gas engineer wishes to sell his product at the cheapest price. But there is going to be a change, so that the consumers shall have more of the saving.

As a matter of fact, if there is a saving by reason of our Bill, with a sliding-scale company generally speaking four-fifths of the saving must go to the consumers?—It does not necessarily follow that they will get it.

With regard to the maximum-price company, if they are paying their maximum dividend and the reserve is full, the whole saving must go to the consumer, assuming honest men?—It is not necessarily a question of honesty. They can expend money thinking they are entitled to.

Manchester, until 1905, had the flat-flame burner. Did they return their illuminating power in 1900 as 19·40 candles, and until the year 1905 did they gradually reduce it to 17·04 candles?—Yes, it was a gradual reduction, because if it had been dropped immediately 4 or 5 candles, it would have had a serious effect on the consumers.

You had not the pluck to do it all at once?—We had not the pluck to commit commercial suicide.

Was not the object to prevent the consumers finding it out?—Our object was to do away with enriching the gas. Our policy is to give the maximum quality of the gas in illuminating power and calorific value which can be obtained without enriching.

After that you dropped, within a fraction, 2 whole candles in one year?—Yes.

In six years you reduced the candle power from 19·40 to 15·30?—Yes; and we gave the consumers or ratepayers the benefit of it.

When you began these operations, the price was 2s. 3d. per 1000 cubic feet, and when you had finished it was still 2s. 3d.?—Yes.

Up to now it is not very patent that the consumers had any advantage?—On paper, no. When I was in charge of the Manchester gas works 10 years ago they were in very bad condition, and we have spent large sums of money out of revenue in bringing them up to date. We also give stoves to the consumers free of rental; and these two items cost us something like £30,000 per annum.

Having got down to the 15·30 candles, and rid of 5 candles, you adopted our burner?—Yes, in order to make ourselves comparable with other undertakings. We do not attach any importance to luminosity of the gas now. We take the calorific value.

Having adopted the burner, you called the gas that you had supplied as 15·30 candles 17·67 candles?—Yes.

Did the heating value go down when you charged to this burner?—It went down in proportion to the loss in illuminating power—3 per cent. per candle.

Did you make any difference in the price?—No. During that year (1906) there was a heavy increase in the price of coal.

But in that year you applied £59,000 to the rates and £57,000 to works?—I am not sure whether that was the year.

The CHAIRMAN: That was the very way in which you suggested the wicked directors might absorb it, instead of distributing it among the consumers?

Witness: The consumers generally, in the case of a company, are not shareholders in the undertaking. With the municipality, the case is rather different.

Mr. HONORATUS LLOYD: Has this Bill, which seeks to prescribe the No. 2 burner, your approval?

Witness: Yes, on certain conditions.

Parliament has prescribed a price and a quality?—A price and an article.

Are you not aware that Parliament has used the word "quality"?—With a particular burner.

And the particular burner is one of the things mentioned under the heading of "quality"?—Yes; but you must take the burner into consideration.

The consumer pays according to the registered measurement by the burner?—He pays for the quality of the gas as shown in the burner. That is the bargain.

There is something which goes through which is not measured; and it is obvious that the balance between what is measured and what is not measured is not paid for?—Oh, no.

The CHAIRMAN: Let me try. Say the consumer pays for 14-candle gas, and he gets 15½ candles?

Witness: He pays for that.

How does he pay? The price is fixed with reference to the 14 candles; it is not fixed in relation to the 15½ candles?—But they would be able to keep up their price of gas so that the consumer should pay. The consumer pays for everything.

In reply to Mr. RAM, witness said that what the consumer had to pay was so much per 1000 cubic feet as supplied to him through his own meter in his own house.

The CHAIRMAN remarked that he had asked to be allowed to see a number of tests in relation to the matter carried out; and the County Council had made arrangements that the Committee should see them made.

It was thereupon arranged that junior Counsel, and Mr. Carpenter for the promoters and Mr. Carr for the petitioners, should accompany the Committee.

Mr. RAM remarked that, whatever tests they might choose to have, he would ask them to have one test made in which the gas was being passed through actually at 5 cubic feet, as specified in the Act.

After a short discussion, it was decided that the decision on the Bill should be deferred until the Liverpool case had been heard, and that there should be a separate reply by Counsel on each case.

Mr. Ram's Speech.

Mr. RAM then proceeded to address the Committee on behalf of the Hastings Corporation. He said he viewed the case with great apprehension, because it was one of the most extraordinary difficulties and complications, and he thought that certain matters had been perhaps unnecessarily imported into it. He submitted, on behalf of the various authorities, that what the consumer really was entitled to in each case was a light specified by the particular Act under which the Company supplied him with light. He also submitted that a fallacy which had been imported into the case was that there was such a thing in the world as a 12, 14, 15, 18, or 20 candle gas. The thing in itself did not exist. It was something which was not ascertained, but ascertainable, and a thing which could only be ascertained by certain conjunction of circumstances. What the customer was entitled to, in each separate case, was such an amount of light as was produced by a certain specified treatment of a certain quality of gas burnt at a certain specified rate in a certain specified burner, and for these he had to pay a specified price. All these considerations hung one on the other; and the Committee could not, in justice to the consumer, alter any one of the ingredients which were necessary for ascertaining the true light without considering in each individual case, and probably altering in each individual case, some, if not all, of the ingredients. If any one of the circumstances were taken away, the bargain as between the gas company and the consumer was changed, unless all the circumstances were taken into consideration, and if necessary all or some of the circumstances so adapted as to meet the altered circumstances of the case. The consumer had not benefited by getting a better production; he had got that to which he was wholly entitled. The promoters contended that the saving effected would be only equivalent to the saving of the loss; but his case was that it would be more than that. He thought it was without dispute between them that if the Bill passed it would be possible for companies to supply to the consumer an article which would be less efficient than he was getting to-day. The poor consumer who used a flat-flame burner must either burn considerably more gas or have a considerably worse light, or he must change his burner and put in at his own cost a more expensive one. The use of the proposed burner would effect more than they were quite willing it should do—make up the injustice; and the consumer ought to have his proportion, in one way or another, of any advantage that went to the company. Counsel then referred to the list of companies who had been put before the Committee by him, and remarked that the same list was put in in the other House by the promoters with a view of showing that there was only one case in which Parliament had made an alteration in the price of gas in consequence of the change in the burner. This was not the fact. The table was erroneous; and he wished to remove from the minds of the Committee any false impression that might exist.

Counsel had not concluded his speech when the Committee adjourned.

Friday, July 8.

When the proceedings were resumed this morning,

Mr. RAM remarked that on the previous evening the Committee intended to see certain tests applied, and asked whether the Chairman desired to say anything on the matter.

The CHAIRMAN thought not. The Committee saw the process adopted in the testing of gas; but anything he might mention would not affect what Mr. Ram might say in continuing his address. They were shown how the photometer worked, and how the test was taken. This was what they wanted to see; and they saw it.

Mr. RAM: I am afraid we have not gained all we had hoped. We have repeatedly challenged the other side to have a test, and we thought it was going to be made in your presence.

The CHAIRMAN: No; not at all. I wanted to see how the testing was worked, and how the new burner and the old one respectively operated when the photometer was applied.

Mr. RAM: Well, then, I leave it at that.

Mr. HUTCHINSON, who appeared for the promoters, said that any results which might have been pretended to be shown would not indicate any results to which importance could be attached.

The CHAIRMAN: As to a test, you may consider that nothing was done.

Mr. RAM said he had hoped the Committee would have seen that which would have enabled them to judge as to the accuracy of the two cases. Continuing his address to the Committee, he said something had happened while this case had been going on. At Ipswich, a reduction in price had been given; and the Corporation had withdrawn their opposition. He believed the same position had been taken up in the case of Ilford; and when Mr. Carr gave his evidence, there had been no cross-examination upon it. These authorities had withdrawn from the Bill; and if the Committee were to give their decision upon the Bill without having the facts relating to these cases placed before them, an injustice would be done both to Hastings and to the Committee.

Mr. HONORATUS LLOYD: The Agent for the Bill tells me that, in reference to the Corporation of Richmond, there was an agreement made two years ago, and a provision has been made with regard to them that nothing in the Bill shall affect the agreement. With reference to the other two cases, the Agent for the Bill has had no information whatever, except that the local authorities have withdrawn. We know no more about it.

Mr. RAM submitted that, before the Committee decided on the Bill, they should know what had been done in these two cases. Year after year arrangements had been made between gas companies and their consumers whereby, to the great advantage of all concerned, alterations had been made. But if the Bill were passed without any recompense or compensation to the consumer, the burner would be imposed upon the country, and there would be no chance of altering it, unless the Gas Referees, or some other body of the sort, altered it universally. The Bill would exclude that. When it was proved to the Committee that these two places had had some concessions made to them in the matter of price, he thought that it would be strongly in favour of the reasonableness of his request that the same should be given to Hastings. There would be a reduction in the illuminating power and the calorific power of the gas which would be to the advantage of the Company; and if the burner were allowed, there should be such an addition made to the candle power as, in the opinion of the Committee, would put the consumer in the same position as he was in to-day. The consumer should either have the price of gas reduced or the candle power raised. But in this case, they were anxious to get a thoroughly good illuminating light, and they would rather that the candle power were increased. With regard to Ilford, the information for which he was asking must be in the possession of the promoters of the Bill; and he was told that Ilford had withdrawn because they had had a clause given to them. He felt that the Committee ought not to be kept in the dark with regard to the facts.

Mr. HONORATUS LLOYD: You are misinformed; there is no clause whatever.

Mr. RAM: Then what is the understanding or agreement that has been arrived at?

Mr. COOPER (the Agent for the Bill): I know nothing of any agreement or understanding.

Mr. RAM said Ilford had withdrawn. He did not know whether it was by understanding, agreement, or what; but what would satisfy Ilford would satisfy Hastings.

Mr. HONORATUS LLOYD: You have it from the Agent for the Bill that no arrangement has been made.

Mr. Honoratus Lloyd's Striking Reply.

Mr. HONORATUS LLOYD, in addressing the Committee on behalf of the promoters, said there were originally eight companies in the Bill; but under the instruction of the House, Liverpool would be dealt with separately. There were thus seven companies left, many of them being important places; and it was to Hastings alone they were indebted for the opposition. The time had come when gas, if it was to remain a competitive factor as against electricity, had got to be reviewed in legislation. In the case of Hastings, the electrical undertaking was run as a municipal trading concern, and on the lines that where there were electric mains the order had gone forth that street lighting with gas should be abolished and electricity substituted—and at a time when such enlightened places as London were returning to gas! Everybody knew that, when gas was supplied at a fair price for public lighting, electricity could not for a moment stand against it. In Hastings, they were doing it at a loss; but they considered nothing except making the municipal undertaking look as favourable as they could. And if gas as a commercial enterprise was to be allowed to stand a good and fair chance, it was necessary that gas companies should be in a position to supply it to the consumers at the lowest price. Gas companies had been looking about to see where savings could be made, and to whom the saving should go; and it had been obvious to Parliament for many years that the old-fashioned tendency of increasing the candle power was a mistake. It meant making a gas that could not be manufactured as a straight gas; and it involved enrichment by means of water gas, benzol, and cannel coal, in order to produce an artificial standard which was not only no good to anybody, but which had a baneful influence. Parliament had recognized this; and the tendency for many years had been to reduce the candle power to 14, and, indeed, to 12. It was reserved to Professor Percy Frankland to come and tell them that Parliament had mistaken the whole policy, and had acted in ignorance; and that throughout all these years both Houses had been doing that which was baneful to the consumer and everybody. He ventured to suggest, when the matter was before the other House, that, in order to support the opposition to the present Bill, the opponents had had to collect the cranks that there were in the gas profession. But there was not a man called before the Committee—or, indeed, a man who could be found—who would say that it was right and proper to keep up the candle power to as high a point as possible. Mr. Isaac Carr, of Widnes, had told them, though he immediately succeeded Professor Frankland in the witness chair, that

he did not agree with the answer given by Professor Frankland in regard to illuminating power. It was agreed, with the exception of Professor Frankland, that the right tendency of Parliament had been to reduce the candle power, because it enabled gas to be manufactured at an economical price and sold at a more reasonable figure, with beneficial results to both consumers and manufacturers.

It was suggested on the other side that there was not such a thing as *x* candle power; and his answer to this was "Rubbish." What Parliament had spoken of, and what Parliament had intended, was *x* candle power as tested by an accurate burner; and he defied the opponents to controvert it. This was the keystone of his case. There was no magical meaning with regard to candle power, as there was with horse power. The thing that was fixed was the maximum price on the one hand, and the candle power on the other; and the thing that might be altered from time to time was the burner which might be prescribed. With regard to the case put forward by Mr. Ram, the basis of the whole point, according to him, was that Parliament intended that *x* candle power, measured by a particular burner, was the keystone of the whole thing; whereas the case for the promoters was that Parliament throughout its history had said, time after time, that it should be *x* candle power with the burner which was supposed at the moment to be the accurate burner. He wished to impress upon the Committee that it was idle to suggest that, when they said 16-candle power by a special burner, as in the Hastings case, Parliament thought they were dealing with some artificial luminosity. It was idle to suggest that Parliament meant 15, 16, or 20 candle power in Hastings to be anything different in Glasgow, Newcastle, or Cornwall. The policy of Parliament had been that the illuminating power of the gas supplied should be equal to *x* candle power accurately measured. It was admitted by everybody who had been in the room on the one side or the other, that the gas-burner which was prescribed in Hastings was inaccurate. Mr. Ram himself admitted, as did his witnesses, that the Hastings burner failed to register the right illuminating power of the gas. In the other House, Mr. Carr had said that the No. 2 burner was the best that was ever invented for testing gas. But between the other House and this, he had made experiments, and satisfied himself that it was not so. And the fact that led him to come to this conclusion was that Mr. Carpenter had said the new burner showed a degree of luminosity with methane gas which, before the introduction of the No. 2 burner, had been described as non-luminous gas. Upon this he had based his changed opinion; and now he came and said: "I, Mr. Carr, am the only man to be found in the chemical world—in the gas industry—who will say that the No. 2 burner is not the best burner up to now invented." But Mr. Carr, having got his gas down to 15·30 candles had adopted the accurate burner—the No. 2. And now he could not understand whether the case against Hastings was that they were not to be allowed to use the burner.

Mr. RAM: I have said that you ought to be allowed to use it.

Mr. HONORATUS LLOYD: But in my learned friend's petition, it is said that we ought not to be allowed to use it. Continuing, he said Mr. Carr had told them that the new burner was capable of fraud, and ought not to be adopted. His Counsel had thrown him over, and said: "Nothing of the sort; you adopt it." But where Mr. Ram and he (Mr. Lloyd) stood together, he would have no fear of Mr. Carr. Mr. Ram's contention was that, if they were to be allowed to use the accurate burner, they ought to give some *quid pro quo*—in some cases a reduction of the standard or maximum price, and in others some additional candle power. But he would like to know why? If Parliament intended that 15, or whatever it might be, candle power was to be accurately measured, he was merely asking that the intention of Parliament should be carried out; and his financial position, the keynote of his whole undertaking, was established by Parliament upon this basis. To put it shortly, Parliament intended that the consumer should be entitled to gas accurately measured; and Parliament established the financial basis of the undertaker on this footing—sometimes prescribing a maximum price, and sometimes a sliding-scale with a standard price. In every case the intention was that the commodity supplied should be accurately measured. The consumer of to-day, with an admittely inaccurate burner, was receiving *x* registered by the burner, *plus y* which passed on to the consumer, and which the test failed to register. The consumer, for the article which he received—namely, *x* which he was entitled to get, *plus y* which he was not entitled to—paid the actual price which was fixed, not by Parliament, but by the demands of trade upon a commercial basis. The company or the local authority fixed the actual price, having regard also always to the maximum or standard. But the maximum or standard price was fixed by Parliament upon the basis of the consumer being entitled to get what was measured by the test accurately. If the new burner was adopted, the consumer would still get *x*, as per test, to which he was always entitled, and which Parliament intended him to have. Inasmuch as the standard was fixed by Parliament, and always would be, upon the basis of supply being *x* as tested, there was no ground whatever for asking Parliament to interfere with the side of the bargain which fixed the price. Now Mr. Ram came along, and said: "I want you to say they should at Hastings supply, not that which Parliament intended them to supply, but that *plus* something else." Was this justice? He had heard of cases where it was said that Parliament was persuaded to put up the candle power from 14 to 15; but was it then suggested that there should be any change in the price—that the company were being called upon to supply a higher quality of gas than Parliament had originally intended, and therefore the price ought to be raised? No. As a matter of fact, there might have been justice in this case, if the companies were here seeking to alter the parliamentary bargain—that was to say, if the companies were saying: "Leave the test alone, but reduce the candle power that Parliament prescribed by how many candles you like." It might then have been remarked with equity: "You companies are seeking to go behind the arrangement, the financial basis, on which Parliament acted, and you are taking away that which Parliament intended; and there should be some alteration of the standard price." But the companies were not seeking to alter the figure which Parliament said should be the basis of their financial arrangement.

Uniformity was what he ventured to impress upon the other House; and here they had Mr. Newbigging, who said that in Manchester he had adopted the No. 2 burner principally in order that he might compare his undertaking with others. The witnesses from Widnes and Manchester had suggested that, though under the Acts of Parliament the profits of a company were provided for, there were ways of diverting profits (some of which they would rather not mention); and if the power asked for in the Bill were granted, the temptation would be such that the companies would depart from their honourable ways. But they objected to the importing of the word "honest;" and Mr. Ram had said that his (Mr. Lloyd's) cross-examination of Mr. Newbigging with reference to what was done at Manchester was an excellent illustration of what might be done elsewhere. But he forgot the whole point, which was that the companies here were operating under Acts of Parliament which prohibited the power of dealing with profits in any way but those provided by the Acts. Mr. Newbigging's Corporation were operating with a free hand. They could go as they pleased; and they had gone as they pleased. They were charging such an extortionate price for gas that they were able to apply large sums, not to the reconstruction of works, but to extension of works, which was a capital charge. Mr. Ram said: "What a horrible example;" and he (Mr. Lloyd) agreed that it was, for municipal trading. But these companies were restricted in this respect; and in the case of Hastings, four-fifths of any saving must go to the consumer. Whatever company they were to take, the saving must, by the very operation of the basis that Parliament had established, inure, either at the moment or eventually, to the benefit of the consumer. But it was suggested that there were methods by which the profits might be diverted. It was not usual in every Act of Parliament to repeat, "Thou shall not steal." The suggestion was that the dividends of shareholders and the fees of directors might be increased; and the companies might find out all sorts of ways in which they might apply the profits rather than reduce the price of gas. But what earthly good would the shareholders and directors be doing themselves? The argument of the companies was that if they were to be allowed to compete with other undertakings, such as electricity, it was necessary that all wanton and unnecessary extravagance should be got rid of. If they could supply gas more economically than to-day, their object was to do it, in order that they might have a chance of life on equal terms. The whole point was that whatever saving there might be would enable them to carry on their business on more economical lines; and the result must be that the customer would either take the whole, or the major part, of any saving that might accrue. They had been under an incubus that had borne heavily, not only on the companies, but on the consumers; and they were asking for relief from this incubus, and that the relief be given on ordinary equitable and statutory terms. It was a mere act of the justice to say: "You shall be called upon to supply with an accurate burner."

On the other side, they said: "But you are injuring the flat-flame consumer." As to the flat-flame burner, it was positively disappearing, and deserved to disappear, because he was working on uneconomical lines. But he did not want the Committee to accept the fact that they were desirous of doing an injury to the poor man; and according to the figures which had been put in by Mr. Carr, the flat-flame consumer would be in the same position. This only showed what could be done by juggling with figures. It was clear that the companies were now simply asking to remove an injustice; and it would be unjust and unfair to cripple them by altering the standard basis of charge, or the maximum basis of charge fixed by Parliament, on the supposition that they were dealing with an accurate test-burner. The case was one of national importance, because it was one which he believed would have the result of reducing the price of gas to the consumer, and enabling the gas companies to carry on their undertakings on better terms with their competitors.

This concluded the case for the No. 1 Bill; but the decision of the Committee was postponed until they had heard the case with regard to Liverpool.

GLASGOW GAS CONSOLIDATION BILL.

The Adjustment of Clauses.

When this Bill (*ante* p. 47) came, on Monday of last week, before the House of Lords Committee, presided over by the DUKE of BEDFORD, for the adjustment of clauses, a discussion arose upon clause 26, which the Committee had amended.

Mr. LEWIS COWARD, who appeared for the manufacturers, engineers, and others, pointed out that the words in sub-clause 2 were:

> Except as by this section otherwise provided, the price to be charged by the Corporation for gas consumed by meter shall at all times be charged equally under like circumstances to all consumers.
>
> The Corporation may supply gas for heating, cooking, or motive power, warming, ventilating, and for the particular requirements of any trade, undertaking, industry, manufacture, or business, and may do all things needful therefor, on such terms and conditions in all respects as may be agreed between the Corporation and the person to whom such supply shall be given: Provided that the rate charged for gas supplied for any of such purposes shall be the same under like circumstances to all persons.

Then there was the proviso: "Provided all that the purposes for which the Corporation may supply gas under this sub-section shall not include lighting purposes." This proviso conflicted with clause 2 of the Bill, which was: "Provided that section 13 (relating to contracts) of that Act (the general law) shall be read and have effect as if that section applied to a supply of gas for any purpose." These unfortunate words made it a little doubtful; and on page 3 of the Bill, in clause 2, there appeared the words "except where expressly varied by this Act." It was going to be contended, he believed, that the Committee had expressly varied this by the proviso to clause 26, which he was sure the Committee never intended. All the opponents were agreed, with the exception of Lord Robert Cecil, who appeared for the Lanarkshire County Council, that it would be better if these words were taken out, because they were unnecessary.

Mr. BALFOUR BROWNE, on behalf of the promoters, agreed that they ought to be taken out.

Lord ROBERT CECIL said he understood that the Committee desired

not to make any alteration with regard to lighting, but with regard to power—that they desired to keep a flat-rate for lighting, but not for power.

Mr. BALFOUR BROWNE pointed out that the Committee had altered it to "under like circumstances" in both cases.

The Committee decided that the words should come out.

Lord ROBERT CECIL then asked for an alteration of clause 2, to the effect that the Corporation should repay any local authority in whom were vested the management of streets, bridges, &c., which might be interfered with by the Corporation, the extra expense to which the local authority might be subjected in consequence of the existence of the works authorized by the Act, and also the reasonable cost of superintendence during the execution of such works.

The Committee, after a short discussion, held that the clause had been disposed of, and could not be re-opened.

Lord ROBERT CECIL then asked to have sub-clause 4 of clause 6, which repealed the powers of the Coatbridge Gas Company to supply gas in the Parish of Old Monkland, struck out.

Mr. BLENNERHASSETT contended that this would affect the Baillieston Gas Company.

Lord ROBERT CECIL remarked that the Committee had put the Baillieston Company into the supplementary area instead of the City supply area; and all he asked was that Coatbridge should be allowed to go into the Baillieston area.

The Committee declined to reconsider this clause also.

Lord ROBERT CECIL pointed out, upon clause 27, that the new clause seemed to cut down the effect of sub-section 4 of clause 26, which provided that:

> The price to be charged for public lamps within the City supply district shall at all times be charged equally (regard being had to the consumption of such lamps respectively) to the Corporation and to all local authorities of boroughs and other districts within the City supply district.

He understood that it was conceded by everybody, promoters and opponents, that it was right and proper that all local authorities should be treated alike. If the new clause 27 remained as it stood at present, there would be a reduction to a large local authority which would not be shared in by a small local authority. It would not be at all just on a question that had nothing to do with trade or commerce that one local authority should be treated differently from another. He suggested at the beginning of the new clause there should be inserted "Subject to the provisions of sub-section 4 of clause 26 of this Act."

Mr. BALFOUR BROWNE agreed that it should be so. It was the intention, and what was put before the Committee.

Mr. VESEY KNOX asked to have inserted in clause 50, with regard to the application of revenue, words similar to those inserted in the Greenock Act of last year.

> Which fund shall be applicable to answer any deficiency at any time happening in the income of the Corporation from their gas undertaking, or to meet any extraordinary claim or demand at any time arising against the Corporation in respect of that undertaking, or for payment of the cost of renewing any part of the gas-works or mains of the Corporation.

Mr. BALFOUR BROWNE said he saw no objection to this proposal. He quite understood, when Mr. Vesey Knox was asking for a reserve fund, that it was to meet any extraordinary claims and to save their reducing the price.

The words were inserted in the Bill.

Mr. VESEY KNOX also proposed to insert:

> Provided also that resort may be had to the reserve fund under the foregoing provision, although such fund may not at the time have reached, or may ave been reduced below, the prescribed amount.

Lord ROBERT CECIL asked what was meant by applying the capital of the reserve fund to any deficiency in the income of the gas undertaking.

Mr. VESEY KNOX replied that if in some year, owing to a misfortune, such as a rise in the price of coal, the Corporation were short, they might go to the reserve fund to make up the shortage. That was, of course, the object of the reserve fund. When the reserve fund was full, the income would go into the revenue account.

The words were ordered to be inserted in the Bill; and the remaining clauses having been finally adjusted, the Bill was ordered to be reported, as amended, to the House.

SWANSEA GAS ORDER.

The Provisional Order to extend the limits of supply of the Swansea Gas Company came before a Committee of the House of Lords, presided over by Lord DONOUGHMORE, last Tuesday.

Mr. VESEY KNOX, K.C., for the Corporation of Swansea, addressing the Committee, said the parties had come to terms which, briefly, were these: "That the charge for gas within one mile of the existing borough boundary should be the same as that charged within the borough of Swansea; the price outside the one-mile limit should not exceed the Swansea price by more than 4d. per 1000 cubic feet. If the Company neglected to extend their mains to Birchgrove within one year of the confirmation of the Order, the Council should be at liberty to put in force their electric lighting powers relating to Birchgrove. The Company should within twelve months extend their mains to the Baptist Chapel at Killay, within 200 yards of Llewitha Bridge." A clause embodying these terms would be drawn up and submitted for approval of Counsel on both sides; and subsequently the Committee would be asked to incorporate it in the Order.

Gas v. Electricity for Museum Lighting.—At the meeting of the Folkestone Town Council last Wednesday, the Borough Surveyor reported that there are 93 gas lights and 18 electric lights in the Library and Museum, and that in consequence of extensions and alterations 50 extra lights would be required. The cost of electric light as compared with gas was 78 per cent. greater. The Museums Committee recommended the adoption of gas; and this was agreed to.

LEGAL INTELLIGENCE.

PROMOTION OF THE AMMAN VALLEY GAS BILL.

Action by Solicitors to Recover Costs.

In the Chancery Division of the High Court of Justice last Tuesday, Mr. Justice Warrington had before him a case in which a firm of Solicitors (Messrs. Jordan and Lamington) sued Mr. Edmund Eaton for their costs in connection with the promotion of the Amman Valley Gas Bill. The defendant denied liability.

Mr. H. TERRELL, K.C., M.P., and Mr. LAVINGTON appeared for the plaintiffs; Mr. MULLIGAN represented the defendant.

Mr. TERRELL said the defendant was the moving spirit in connection with the Amman Valley Gas Company; and he desired to promote a Bill in Parliament for the purpose of getting statutory powers. There was a Company called the Gas and Water Works Supply and Construction Company, which Mr. Eaton had incorporated, and it was the fountain head of other companies. The Amman Valley Gas Company had obtained certain permissions from the Local Authority in the Amman Valley to lay mains; but as they had not fulfilled the contract upon which the licence had been granted, the authority gave them notice to take up the pipes. Thereupon Mr. Eaton desired to promote a Bill in order to give the Company statutory powers to lay mains and to do the necessary work. Mr. Eaton was a Director, and he instructed the plaintiffs to procure the passing of the Bill. Plaintiffs asked for a guarantee for their costs; and on Nov. 2, 1908, Mr. Eaton gave them a guarantee for their professional costs to the extent of £25, and undertook to obtain for them, or give them, a further guarantee for their costs as and when required. The promotion of the Bill went on, and plaintiffs over and over again asked for their guarantee; but they never got their money, except the £25 mentioned. Eventually the plaintiffs were told not to go on. They had recovered judgment against the Company for their costs; and they now sued Mr. Eaton, as they would obtain nothing from the Company.

Mr. MULLIGAN argued that if Mr. Eaton intended that the guarantee given should be for all the costs incurred, it would have been sufficient to say so, and there need not have been any mention of the £25. If the plaintiffs chose to go on when the defendant refused the guarantee, the fault was theirs. Mr. Eaton never intended to guarantee an unlimited amount.

Justice WARRINGTON held that there was a plain contract by the defendant to guarantee the costs incurred by plaintiffs to the full extent, and that there was nothing to limit the amount to £25. There must, therefore, be judgment for plaintiffs for £277 14s. 8d., the amount of their costs, and £5 6s., their costs in the action against the Company; and defendant must pay the costs of the present action.

Gas Poisoning through Alleged Defective Fittings.

At the Westminster County Court last Friday, his Honour Judge Woodfall had before him a case in which Mr. Archibald Clark and his wife claimed damages from the Gaslight and Coke Company for personal injuries sustained by Mrs. Clark owing, as was alleged, to their negligence. Mr. M. O'Connor appeared for plaintiffs; Mr. Vaughan Williams represented defendants. The plaintiff resided at Plaistow, at a house where gas was supplied on the slot system. He had this altered to an ordinary supply; buying the fittings from the defendants for £1 16s. 6d. In January last year, he moved to East Ham; and the defendants removed the fittings and fixed them for a charge of £1. In September, a pendant in the dining-room fell, and Mrs. Clark held it up to the service-pipe in the ceiling for 40 minutes until a plumber was found—this being necessary, as the key supplied by the defendants would not, it was alleged, fit the tap, and the gas could not be turned off at the meter. The gas escaped all the time, and Mrs. Clark suffered from gas poisoning. It was contended that the fittings were unsuitable for the purpose for which they were supplied—the Sale of Gas Act being cited. The defence was that the pendant was properly fixed and tested, and the key supplied fitted the cock on the meter. The jury, after an hour's deliberation, found that the pendant was properly fixed, and that the key was reasonably fit for the purpose for which it was intended. Judge Woodfall entered judgment for the defendants, with costs.

Mr. Ewing's Action against the Greenock Corporation.

Our Scotch correspondent, writing on Saturday, says: As foreshadowed in last week's "Notes," the action by Mr. Ewing against the Corporation of Greenock was called in the First Division of the Court of Session on Tuesday morning. Mr. Macmillan, for the defenders, stated that the pursuer and reclaimer had taken no steps for proceeding with the case, and had not printed the productions. In these circumstances, he understood that the case was not to be further proceeded with; and he moved that the reclaiming note be refused, in respect of no appearance for the reclaimer. The motion was granted.

Kenilworth Gas Company.—At the annual meeting of the Kenilworth Gas Company, the shareholders adopted the report, which recommended the payment of the 5 per cent. preference dividend, and 7½ per cent., free of income-tax, on the ordinary shares. The Chairman (Mr. T. Kemp) said the past year had been one of exceptional success; the Directors were able to recommend an extra ½ per cent. dividend, and to reduce the price of gas by 3d. per 1000 cubic feet. Special meetings of both preference and ordinary shareholders were afterwards held to sanction an increase in the Company's capital by £2000 in preference shares, to rank *pari passu* with the existing shares. The Chairman explained that the money was needed in order to pay for a new gasholder in course of erection at the works. Both meetings approved of the resolution.

MISCELLANEOUS NEWS.

BELFAST GAS-WORKS EXTENSIONS.

The Twin Island Site Again.

The minutes presented by the Gas Committee at the last monthly meeting of the Belfast Corporation contained several references to the proposed extension of the gas-works. The Committee had approved of the draft of a proposed agreement between the Corporation and the Harbour Commissioners for the acquisition of ground at the Twin Island for the erection of auxiliary gas-works, and had forwarded it to the Solicitor of the Commissioners for approval. The Chairman of the Committee (Mr. J. A. Doran) intimated to the Committee that, with the Acting-Manager (Mr. Sieers), he had been considering the question of the congestion at the Ormeau Road works, and, with the view to ascertain what rearrangement and extension could be effected there, a plan and explanatory statement had been prepared, which he submitted to the Committee for their consideration.

The adoption of the minutes having been formally moved by Mr. Doran, Mr. Squire, in seconding the motion, reminded the Council that, when the Twin Island site was under consideration early in the year, an amendment in favour of such a rearrangement as the Chairman of the Committee was proposing was defeated. He wished the public to understand that this matter had been before the Council, and had been debated and overruled; and therefore it was not possible—meanwhile, at any rate—to reconsider it. If the public only knew that the scheme now suggested would cost from £150,000 to £160,000 before they came to deal with the ground, he thought they would have nothing to do with it. Mr. Curley said he believed Mr. Doran was on the right lines, and that there was ample space on each side of the present gas-works for the necessary extensions. He was of opinion that every facility existed for enlarging the present works at a moderate outlay; and some of the necessary property now belonged to the Corporation, while the remainder could be easily secured.

Mr. M'Keown thought it was premature for either the Council or the Gas Committee to enter into any agreement with the Harbour Commissioners; and he said he would move, as an amendment, that the part of the minutes referring to the agreement be referred back to the Committee for consideration. The Town Clerk (Mr. R. Meyer) said the deletion of the minute would serve no purpose, as it had already been acted upon, and was in accordance with the direction given by the Council that the Gas Committee and the Law Committee should be instructed to take steps to acquire the Twin Island property.

Mr. Doran, in reply, said that the Committee were not bound to the Harbour Commissioners. If they proposed to take their ground, it was on the understanding that the Corporation could get a Bill passed; and if they did not, there was no harm done. The experts whose services they had engaged told them that they would not be able to supply the city with gas in 1914 with the existing works; and if this was so, was it not the duty of the Committee to provide what was necessary to meet the increased demands? He himself was not tied to any site. Mr. Squire said the suggested rearrangement and extension of the present works had been discussed before; but he could not remember it. Was he to be told that if any member wished to formulate a scheme that would save the ratepayers half-a-million of money it was not to be done? The matter would be further discussed; for a requisition would be signed asking for a special meeting to be held at which the whole question could be considered.

The minutes were then passed.

BRADFORD CORPORATION GAS DEPARTMENT.

Annual Report of the Engineer and Manager.

The Gas Engineer and Manager of the Bradford Corporation (Mr. Charles Wood) has presented to the Gas Committee his report on the working of the gas undertaking in the twelve months ended the 31st of March last. It is accompanied by an analysis of the gas accounts, compared with those for the preceding year.

Mr. Wood says the most striking and satisfactory feature of the balance-sheet for the past year is that every item of expenditure on the manufacture and distribution of gas shows an improvement over the previous year. On the other side, there was a reduced revenue from coke; but as the price of this residual is invariably affected by the fluctuations in coal prices, it was inevitable that considerably less should be received in the period covered. Spent oxide produced a little less last year than before; the reason for this being that less new oxide was used, and therefore there was not so much to sell. This item should be deducted from the cost of purification. Thus upon every single item under the control of the Engineer, an improvement took place last year.

The total quantity of gas produced during the year was 2,071,179 000 cubic feet; being an increase of 5,068,000 cubic feet, or 0·24 per cent., compared with the previous year. The gas sold, including 155,086,000 cubic feet used in the public lamps, amounted to 1,944,971,000 cubic feet, or an increase of 0·43 per cent. Mr. Wood gives a table showing the quantities of gas sold in different districts during the year ended Dec. 31 last, and for the preceding year. For purposes of comparison, the figures for 1899 are also given; this period being prior to the taking over of the North Bierley, Clayton, Eccleshill, Idle, and Heaton districts. The table shows that for the first time there was an improvement in every district.

During the year ended March 31 last, 198,009 tons of coal and cannel were carbonized; 5·52 per cent. of cannel being used, against 5·41 per cent. in 1908-9. The average cost of the coal was 10s. 9·25d. per ton; the previous figure being 10s. 11·98d. The quantity of coal carbonized per retort was 307 lbs.; being exactly the same as for the previous twelve months. The gas made per ton of coal was 10,460 cubic feet—an increase of 230 cubic feet.

Dealing with the revenue account for the year, Mr. Wood remarks that the total salaries for manufacture, distribution, and management amounted to £5510, and carbonizing wages to £27,924; being decreases of £28 and £397 respectively. Coal cost £106,638, or £4423 less; and the expenditure on purification was £4158, or £718 less. The sum of £26,661 was spent on the repair and maintenance of works; being a decrease of £1405. The repairs to mains and services, including the cost of new services, amounted to £5488—a drop of £764; and £241 less was spent on the repair of meters. Meter inspection cost £3658, or a decrease of £53. The Finance Committee's charges for administration and the collection of accounts were £1700—the same as for several years past. Miscellaneous expenses amounted to £332 more, stationery cost £116 more, and bad debts (£1332) increased by £463. The Committee paid £14,258 for rates, or £14 more than in 1908-9. The Stove Department cost £3573; but the revenue therefrom was £4156—leaving a balance of profit of £583, against £101 before. Mr. Wood says this is very satisfactory, and shows the year to have been the best since the opening of this branch of the Department.

The following are the main items of income: £188,083 was received for gas—an increase of £974; meter-rents amounted to £2580, or £32 increase; coke yielded £32,695, or £4087 less, the cause of which has been explained; tar brought in £11,166, or an increase of £112; ammoniacal liquor produced £16,826, an increase of £418; while the sale of spent oxide yielded £2500—a fall of £45. The cost of coal, less residuals (excluding the profit on the chemical works), was £45,950; being £868 better than for the year 1908-9. Purification, less the revenue from spent oxide, cost £1657, or £673 better; and the rents received amounted to £1004, or £18 less. The gross profit on the chemical works, including the profit on the sale of ammoniacal liquor, was £3365, against £4273 before. The gross profit for the twelve months amounted to £58,405; being £4065 more than for the preceding year. Interest on loans, &c., amounted to £29,635, which is a decrease of £679, instead of the normal decrease of £1000. Income-tax was £34 more; while the contribution of £26,615 to the sinking fund shows an increase of £50. The net loss is thus £737, or £4568 better than in 1908-9. During the year, the sum of £4507 was spent on capital account for the gas undertaking (entirely upon mains), and £390 at the chemical works. These sums bring up the total capital expenditure to £1,165,631.

During the past year, only £26,000 was received towards the cost of street lighting. The amount paid for gas used for this purpose worked out at 1s. 4½d. per 1000 cubic feet. For the current year, the Committee are to have £27,500.

The principal items of the working results are given in the tables appended to the report, and every item shows an improvement. The average price of gas in the holders has fallen from 11·912d. to 11·601d. per 1000 cubic feet. The average illuminating power of the gas supplied during the year was 16·81 candles, as officially tested; but Mr. Wood says it must be remembered, when comparing the results with others, that in Bradford the Act of Parliament requires a certain old type of burner to be used. When tested by the new "Metropolitan," No. 2 argand burner, Bradford gas gave an increased value of from 3¾ to 4 candles.

The following are some of the items from the working statement for the past year; the figures for 1908-9 being given for comparison:—

	1908-9.		1909-10.
Coal and cannel carbonized, tons	201,952	..	198,009
Gas made, thousands of cubic feet	2,066,111	..	2,071,179
,, per ton of coal, cubic feet	10,230	..	10,460
,, per retort charged, cubic feet	1,405	..	1,436
Retorts charged	1,470,228	..	1,442,121
Gas accounted for, thousands of cubic feet	1,936,574	..	1,944,971
,, ,, per ton of coal, cubic feet	9,589	..	9,823
,, ,, per cent. on make	93·73	..	93·91
Coke and breeze saleable, tons	87,293	..	86,883
,, ,, per ton of coal, cwt.	8·64	..	8·77
Tar made, tons	12,300	..	12,171
,, per ton of coal, gallons	11·87	..	11·98
Liquor made, tons	27,760	..	27,413
,, ,, per ton of coal, gallons	30·03	..	30·24

The analysis of the accounts shows that the net cost of gas was £129,678, or at the rate of 16·002d. per 1000 cubic feet of gas sold, compared with £132,769, or 16·454d. per 1000 cubic feet sold, in 1908-9. The net loss last year was, as shown above, £737, against £5305 before; the rates per 1000 cubic feet of gas sold being respectively 0·091d. and 0·658d.

OLDHAM CORPORATION GAS DEPARTMENT.

Annual Report of the General Manager.

The General Manager of the Gas Department of the Oldham Corporation (Mr. Arthur Andrew) has presented his annual report, which furnishes the following particulars.

The gross revenue for the past financial year amounts to £168,173, and the gross expenditure to £135,064; the balance carried to the profit and loss account being £33,109. The annuities amounted to £3348, the interest on loans and stock to £13,721, and the sums payable to the respective sinking funds to £5298—making £22,367; the net profit on the year's working being £10,742. Adding the balance brought forward, and deducting the amount to which the Corporation are entitled in aid of the borough fund (£9142), there is left a credit balance of £19,158. There was an increase in the amount received for residual products; the average price obtained for coke being 4·24d. per ton less than during the previous year, and 3s. 5d. per ton more in the case of tar. The cost of carbonizing (labour) was further reduced to the extent of 0·097d. per 1000 cubic feet of gas sold, due to less hand stoking being employed during the past winter, in consequence of the lessened consumption of gas caused by the bad state of trade.

The cost of fixing cookers free during the year amounted to £1728. The quantity of gas supplied to the street-lamps and to the municipal

buildings (free) was 83,686,000 cubic feet. The amount expended on the street lighting account exceeded the estimate by £326. The total number of lamps fixed in the whole of the supply area on the 25th of March was 5880. The number of incandescent lamps on that date was 4002 within the borough and 1404 in the out-townships; being an increase of 1016. The whole of the lamps within the municipal borough are now on the incandescent system. On the 25th of March last, the duty of supervising the lighting of the public streets devolved upon the Finance Committee. This change was deemed to be desirable owing to the Gas Committee ceasing to supply gas free for public purposes, as had been the case since 1886.

The quantity of gas manufactured at the different stations during the year was: Oldham, 68,770,000 cubic feet; Higginshaw, 699,626,000 cubic feet; Hollinwood, 546,945,000 cubic feet; do. (water-gas plant), 74,962,000 cubic feet—total, 1,390,303,000 cubic feet, compared with 1,434,643,000 cubic feet in the preceding year, being a decrease of 44,340,000 cubic feet, or 3·09 per cent. The following quantities of coal, oil, and benzol were used in its production: Coal, 112,747 tons 8½ cwt.; gas oil, 218,858 gallons; benzol, 106,783 gallons. The average quantity of coal gas made per ton of coal carbonized was 11,666 cubic feet, compared with 11,717 cubic feet in the year 1908-9. The loss of gas from leakage, &c., was 73,837,000 cubic feet, or 5·31 per cent. of the quantity made, compared with 69,320,000 cubic feet, or 4·83 per cent., before. The policy of renewing very old mains, and the enlargement of small ones, was pursued during the year, with very beneficial results; and the quantity of gas afterwards consumed has generally shown an increase. The maximum quantity of gas delivered in 24 hours was 7,609,000 cubic feet, on Jan. 6 last, compared with 8,366,000 cubic feet the previous year; being a decrease of 757,000 cubic feet. The minimum quantity delivered was 1,572,000 cubic feet on June 4, compared with 1,504,000 cubic feet before; being an increase of 68,000 cubic feet. The average illuminating power of the gas, as tested by the No. 2 "Metropolitan" burner, was 20·11 candles.

The total number of meters fixed on the 25th of March last was 52,810, of which 2662 are of the prepayment type; 995 meters were fixed in new premises and others in which gas had not previously been used; and 144 meters were permanently disconnected. The actual number of consumers at the close of the financial year was 47,468. The number of meters fixed but not in use was 2401—a reduction of 696 during the year. The net increase in the number of additional cooking stoves and grillers fixed free of charge to consumers was 2062. The total number in use on the 25th of March last was 17,078, excluding stoves owned by consumers. There was an increase of 3,031,000 cubic feet in the quantity of gas used by private consumers in houses and shops, and a decrease of 51,853,000 cubic feet in that consumed in mills and workshops; the decrease being caused entirely by short time in the cotton-spinning mills and bad trade in the machine-making works. Consequent on the bad trade and the reduced wages paid, there was a strong tendency to economize in the consumption of gas in private houses, particularly in the latter half of the year. The quantity of gas consumed through prepayment meters was 18,299,000 cubic feet.

The Improvement Act obtained last year enables the Corporation to manufacture residual products, and also gives increased powers regarding the pipes and fittings on consumers' premises, for testing the illuminating power of the gas by the "Metropolitan" argand No. 2 burner, and for the borrowing of a sum of £198,200 to carry out various extensions—the principal being a new gasholder and tank at Hollinwood, to have a capacity of over 5,000,000 cubic feet. The Act, on the other hand, has altered or modified certain powers which the Corporation possessed previously; the principal of these being the limitation of the profits which may be applied to the reduction of the borough rate to a fixed sum of £7500 per annum. The power to supply gas without charge for street lighting and other public purposes is now limited by the Act to public clocks, throughout the whole area of supply, and the Oldham Infirmary. The Act gives the Corporation the option of charging for gas consumed for public purposes within the area of supply at 10 per cent. less than the amount chargeable to private consumers for a corresponding supply.

SALFORD CORPORATION GAS DEPARTMENT.

The Past Year's Working.

The Chairman of the Gas Committee of the Salford Corporation (Mr. F. S. Phillips) has presented to the Town Council their report for the year ended the 31st of March last. They express their pleasure in recording that the usual growth in the number of consumers was maintained during the period named. The sales of gas, however, showed a slight decrease, equal to 0·01 per cent., probably due to the continued depression in trade during the year. The demand for gas appliances generally was very satisfactory; and the business in cooking-stoves increased. The works and plant (under the supervision of Mr. W. W. Woodward, the Engineer and Manager) were being maintained in a thoroughly efficient condition; and a contract was let for the renewal of one of the gasholders at the Bloom Street Works—the existing holder having been in use for about fifty years. The coal and cannel carbonized during the past year amounted to 162,327 tons, and the quantity of gas made to 1,651,845,000 cubic feet, of an average illuminating power equal to 19·28 standard candles; the parliamentary standard being 18 candles within the borough and 17 candles as tested in the out-districts.

The accounts show that the net revenue from the sale of gas was £173,385; residuals produced £50,778; and the total receipts were £226,474. The expenditure in manufacture was £123,358; on distribution, £15,844; on management, £8036; and the total expenses were £166,853—leaving a balance of £59,621 to go to the profit and loss account. After meeting interest and redemption charges and allowing £6500 for depreciation, there was a balance of £15,034 transferred to the district fund account.

The Hartley Witney Rural District Council have decided to borrow £1015 for the extension and improvement of their water-works.

STOCKPORT CORPORATION GAS DEPARTMENT.

Engineer's Annual Report.

The Gas Engineer of the Stockport Corporation (Mr. S. Meunier) has presented to the Gas Committee his report for the year ending the 31st of March. It furnishes the following particulars in regard to the working of the gas undertaking in this period.

Mr. Meunier says the year, as a whole, was a very satisfactory one, though the net profits were about £436 less than before, due practically to an extra repayment on an outstanding loan. But for this it would have shown an additional £1160, or £724 increase, so following the gross profit, which rose by £696 to £41,077—the highest figure ever reached. The coal market was easier last year than in 1908-9, and the Committee were enabled to obtain coal at a somewhat reduced price per ton. This, with the further improved results obtained per ton carbonized, was of very material benefit to the Gas Department. The figures are 2436 tons more coal used, 26,253,000 cubic feet more gas made, and an average of 12,016 cubic feet of gas obtained per ton of coal carbonized, against 11,923 cubic feet before. Unfortunately, the advantage thus gained has been practically wiped out by the greatly diminished revenue from coke—viz., £2476—though the quantity made for sale per ton of coal carbonized was very nearly the same as in the previous year, and there was an additional quantity disposed of, amounting to 4565 tons. The receipts from tar advanced by £496; but those for ammoniacal liquor just about held their own—the quantity made per ton of coal carbonized being, in each case, about the same as before.

Nearly 24 million cubic feet more gas were disposed of during the past year than in 1908-9; the larger proportion having been taken by prepayment meter consumers. The gross income on the item of gas sold shows the satisfactory increase of £2692; but this is reduced to a net gain of only £382, or, including public lighting, £541, by the somewhat higher rate of industrial discount earned during the year, and for prompt payment. To this must be added the last, and certainly the greatest, factor in the reduction—viz., the last scale of further discounts to large industrial consumers on the quantity used; the whole showing a total increase of no less than £2310 for the year, or upwards of 26 per cent. The total discounts allowed average nearly 12 per cent. of the total receipts, not including public lighting. The half-penny in the shilling allowed to automatic meter consumers also had a marked effect upon the revenue.

The cost of making coal gas shows a net reduction on coal of £1306 and on stokers' wages of £492. Though the wages for purification were £85 higher, there was a reduction of £297 in the material used. The net reduction on this account is £1876. Carburetted water gas also shows a good result; there being a saving of £109 on oil, due to better contracts, and £123 on wages; though materials, including coke, and wages for maintenance increased by £88. The expenditure on the maintenance of works was reduced by £174, and on distribution and maintenance of mains by £399; but public lighting shows an increased cost of £193.

Next to the diminished revenue from coke, the item of rates and taxes is perhaps the most important one adversely affecting the past year's returns; the increase amounting to no less than £1315, partly due to payment of disputed income-tax kept back and not included in the previous year's accounts, and partly to increased taxation.

Summing up the accounts, Mr. Meunier says it may be taken that the items of predominating influence on the year's results are, on the diminished receipts and additional expenditure side, coke receipts, £2476; rates and taxes, £1315; and discounts, £2310—total, £6101. As partially counteracting these, are the saving on oil, £1092; on coal, £1306; and on carbonizing wages, £492—total, £2890. The gross profit of £41,077 has been allocated as follows: Interest, £7908; sinking fund, £11,577; stock redemption, £538; in aid of rates, £18,000; and placed to the reserve fund, £3054. A sum of £1288, or £1472 less than in the year 1908-9, was paid out of the reserve fund account, principally on the retort-house roof alterations, &c., and new boilers. The balance now stands at £7227, or £116 more than before.

With regard to the works, Mr. Meunier says the new reinforced liquor-tank is being proceeded with, and, with the new boilers, will be brought into use next winter. The old settings erected in 1892 have now been cleared out of the retort-house, and the drawings for the further extension of inclined retorts to take their place are well in hand. The alterations will increase the gas-making facilities on the same site from 1,250,000 to more than 2,000,000 cubic feet per day.

The Disposal of Profits—Rate Relief v. Reduced Price.

The foregoing report came before the Town Council at the monthly meeting last Wednesday, and gave rise to some discussion.

Mr. J. FERNLEY, J.P., the Chairman of the Gas Committee, in moving the adoption of the report, said the gross profit on the working of the gas undertaking in the past financial year was £41,077, which created a new record; and it had not been produced, as some member of the Council might say, by reducing the illuminating power of the gas, but chiefly by the increased make per ton of coal carbonized—viz., 12,016 cubic feet, against 11,923 cubic feet the preceding year. The Committee were able to purchase coal, of which they used about 50,000 tons per annum, at a reduction of £1306. The ratepayers, who were the owners of this business, would, he felt sure, be satisfied with the dividend they would receive—viz., practically £20,000 in relief of the rates. Yet the gas consumers had no ground for complaint, as the net profit amounted to 8·48 per cent., which could not be considered too much; and the price of gas in Stockport, as he had frequently pointed out, was most reasonable.

Mr. J. WINTER seconded the motion.

Mr. BREWSTER said it was no doubt gratifying to the Chairman of the Committee and the Gas Engineer to see the output of gas go up; but he submitted that the whole of the realized profits were produced by the consumers who paid the ordinary price for gas. He had examined two bills for gas supplied to trade consumers. One came to

more than £200; and after trade and other discounts were deducted, it was actually settled for £66. The other bill was of a similar character. It was contended that if the price of gas was reduced, the rates would go up. Probably this would be so. He, however, found that the more he looked into the question the more aggravating it became. It was not only that the gas consumers were paying a good portion of the rates of the non-consumers, but those who were paying the ordinary price for lighting were actually paying the rates for people who were getting gas at the reduced figures. He considered that tradesmen and others who used a great deal of gas for illuminating purposes in their businesses should have it at the same price as people who had gas-engines. It was difficult to convince a Council composed chiefly of large property owners that an alteration in the system would be right; but it would take the rate from one class and put it on those who owned properties.

Mr. HOPKINS supported these remarks. He said he found that in 1890 the price of gas to ordinary consumers was 2s. 5d. and 2s. 6d. in the borough, and 3s. outside; and it was practically the same now. The profits handed over to the rates in 1890 amounted to £6000; and by improved manufacture and better management they had gone up to £18,000. The cost of gas, however, to the ordinary consumers was the same; and relief was given to large ratepayers from the profits that were made.

Alderman WHITE pointed out that twenty years ago Stockport gas was 21 and 22 candle power, whereas now it was only 17-candle power. The quality was deteriorating in order that the Committee might supply power gas; and the ordinary consumers had to go to considerable expense in obtaining fittings so that they might use the class of gas now supplied. He thought no concern but one having a great monopoly would attempt to make a profit at the price at which gas was supplied for power purposes.

Mr. SIMPSON considered the price of gas supplied to the ordinary consumers was exorbitant. He did not think they should be charged 2s. 6d. per 1000 cubic feet, while other people were having gas at practically cost price. He did not say that all the profits should be given to the gas consumers; but he thought there was a fair and just way of dealing with them. He noticed that during the past year the Gas Department sold some 24 million cubic feet more gas than in the previous year, while coal had cost about £1300 less and oil about £1000 less; but still the profits were not larger. He thought the demand made by the Chairman of the Gas Committee last year for a great reduction in the price of gas used for industrial purposes had not been justified by results. He should like to know how much of the profit was derived from uses of gas for industrial purposes, how much from the prepayment and ordinary meter users, and how much from public lighting.

Mr. FERNLEY said he had replied to the remarks of Mr. Brewster and Alderman White before, as the members of the Council had heard the same tale half-a-dozen times. It was not material to the Gas Committee where the profits went. It was their duty to make as much money as they could in the interests of the town and the ratepayers. Having done this, it was for the Council—who were largely influenced by the demands of the town, and to some extent guided by the Chairman of the Finance Committee—to say what must be done with the profits. A material reduction in price was made twelve months ago to prepayment meter users, and it had led to a large increase in consumption; the consumers by the new method getting their gas at a very low price, considering the extra cost of collection. If the Finance Committee would be favourable to a reduction in the price of gas, he, as Chairman of the Gas Committee, would favour it. But as a member of the Finance Committee, he had to look the other side of the ledger; and this was his difficulty. Replying to Mr. Simpson, he pointed out that while there had been an increased consumption of gas and a reduction in the price of coal, coke receipts had diminished by £2476, their rates and taxes cost them £1315 more (partly due to payment of disputed income-tax not included in the previous year's accounts), and additional discounts of £2310—making a total of £6101. This was the other side, which Mr. Simpson apparently did not see.

The report was unanimously adopted.

PROGRESS OF THE LINCOLN GAS-WORKS.

In recent issues, some particulars have been given of the past year's working of the Lincoln Corporation gas undertaking; and these were supplemented at last week's meeting of the City Council by a statement regarding the progress since the works were acquired, which was made by the Chairman of the Gas Committee (Alderman Wallis).

Alderman Wallis remarked that, on the previous Thursday, it was 25 years since the Corporation acquired the undertaking of the Lincoln Gas Company, and he thought it would perhaps be interesting if he briefly reviewed its history during the period of municipal control. The record of the undertaking had been one of steady progress. He gave figures to illustrate this growth as follows:—

	1885-7		1909-10.
Annual make of gas .	162,319,000 cu. ft.	..	383,852,000 cu. ft.
Coal carbonized. . .	15,804 tons	..	31,357 tons
Oil used	None	..	97,855 galls.
Number of consumers .	5,611	..	11,740
Length of mains . .	37 miles 200 yds.	..	60 miles 975 yds.
Total income . . .	£25,514 7s. 7d.	..	£49,470 5s. 10d.
Gross profit	£8,973 18s. 6d.	..	£14,235 9s. 5d.
Average selling price of gas	2s. 8d.	..	2s. 0½d. per 1000 cu. ft.

In the year 1886, he said, the Corporation decided to let cooking-stoves on simple hire; and about 4000 had been fixed. The result was a large increase in the consumption of gas during the summer months. In 1895, the sulphate of ammonia plant was erected at Bracebridge; and it had proved a steady source of revenue each year since it was installed. The next important addition was made in 1900, by the erection of the carburetted water-gas apparatus. This plant was capable of producing 500,000 cubic feet of gas in 24 hours; and, with a small additional outlay, its capacity could be increased to a million feet per day, and so provide for the growing demands of the city and district for many years to come. It cost £15,000. In 1907, stoking machinery was installed at Bracebridge works; and it was proving a very remunerative investment. It cost £3500. In addition to the above-mentioned extensions, the Commiteee had purchased 32 coal-waggons, at a cost of nearly £2000; and they had renewed the purifiers, at a cost of £3134. During the period under review, the price of gas had been reduced from 2s. 8d. to 2s. 1d. per 1000 cubic feet, the meter-rents had been abolished altogether, and cooker rents for the two winter quarters. Discounts of 7½ per cent. had been allowed to large consumers, and 10 per cent. to users of prepayment meters. The value of these concessions to the public at the present time was no less than £13,700 per year. A total sum of £29,700 had been paid out of profit in relief of the general district rate; and £62,600 had been provided for sinking fund purposes for the repayment of capital. The Gas Committee had always followed the practice of paying for all extensions and improvements of the works and distributing plant out of profits; and to this sound and prudent policy might be attributed the strong financial position in which the undertaking stood to-day. With an annual make of gas approaching 400 million cubic feet, the capital liability was £62,600 less than when the yearly output was only 162 millions. It was interesting to note—and he said it with some pride—that there had been only one change in the chairmanship of the Gas Committee during tha 25 years. He thanked Mr. John Carter (the Engineer and Manager) for the trouble he had taken in preparing the statement from which he had given these figures.

HEREFORD CORPORATION GAS UNDERTAKING.

Reduction in Price.

In his fourth annual report to the Hereford Corporation Gas Committee, Mr. W. W. Townsend, the Engineer and Manager, says the sales of gas increased during the past year by over 4½ million cubic feet, of which the ordinary consumers took nearly 2½ millions, and the slot consumers over 2 millions. The amount of gas made was only 3½ million cubic feet more than in the previous year, as the leakage was reduced from 9,293,000 to 8,226,590 feet—from 6·8 to 5·9 per cent. The coal carbonized was 12,262 tons, against 12,314 tons; the yield of gas being 11,540 cubic feet per ton, against 11,254 feet. Compared with the year ending March 25, 1906, the gas made has increased by 7,686,000 cubic feet, while the gas sold has increased by 12,548,000 feet; the other 5,000,000 feet having been saved in various ways. The increase in sales since 1906 amounts to over 10 per cent. on the consumption of that year. The gas sold per ton of coal carbonized stands this year at 10,644 cubic feet, compared with 10,224 feet last year and 9974 feet in 1906. The other working results were about the same as the previous year, and nearly the same quantity of residual products was sold; but the prices obtained for residuals were all lower, particularly in the case of coke, which realized £317 less in consequence. Tar dropped by £7, and sulphate of ammonia brought in £44 less for the same reason. The amount saved through the lower price paid for coal (£380) was thus counterbalanced by the decreased sum obtained for residuals. The gas-rental (ordinary consumers) produced £194 more; and in spite of the extra discount allowed to slot consumers, amounting to £386, the net revenue from this source was only £122 less, and the gross revenue was only £18 less. The amount charged to maintenance of works is even higher than last year's abnormal figure; the Committee having adopted the policy of charging everything possible to revenue. Included in this sum are several exceptional items, such as the renewal of the railway siding, the erection of conveniences for the workmen, the provision of new retort-house plant, &c. The expenditure on the works and mains is gradually bringing them into a condition which enables a high standard of efficiency to be maintained, and will in the end save the Council from a very much greater expense. The same policy is being pursued in regard to meters; £80 more having been spent on the repair of old meters during the past year than in 1908. Rents, rates, and taxes increased by £71. Lamp-lighting and repairs cost £21 less. The gross profit for the year was £4107, against £4388, or £281 less. After payment of interest and sinking fund, there will remain a disposable balance on the year's working of £1448. It should be noted that the profit and loss account is charged with £75 extra for special sinking fund, and that the sinking fund payments for 1908 loans appear in the accounts for the first time.

The season just passed has been the best yet experienced with regard to the business done in gas-fires; and further developments may be expected in this direction.

The quantity of gas made was 138,754,000 cubic feet; the coal carbonized amounting to 12,262 tons. The gas made per ton of coal was 11,315 cubic feet. The gas sold showed an increase of 3·8 per cent. The revenue from the sale of gas and meter-rents was 2s. 7·4d. per 1000 cubic feet of gas sold; while the cost price of gas, after deducting receipts from residuals and profit on fittings and stoves, was 1s. 11·8d. per 1000 feet. The net profit per 1000 cubic feet, after deducting interest and sinking fund, was 2·5d. The cost price of gas in the holder, not including rates and taxes, was 1s. 3d. per 1000 cubic feet made.

The Committee recommended that the price of gas to ordinary consumers (other than gas supplied to slot-meter users or for street lighting purposes) be reduced by 3d. per 1000 cubic feet to 2s. 6d. (with 3d. off for discount); the reduction to date from the quarter commencing Sept. 29. They also stated that, at the request of the Finance Committee, they had agreed to transfer to the borough fund the sum of £1000 from the balance standing to the credit of the gas revenue account.

In moving the adoption of the Committee's report at last Tuesday's meeting of the City Council, Mr. Witts said that in Mr. Townsend they had a Manager in whom they had the greatest confidence, and one who had the business of the undertaking in hand night and day. Mr. Bulmer also congratulated the Committee on the admirable report, and acknowledged specially the work of Mr. Witts and Mr. Townsend. Others members having spoken in the same strain, the report was adopted.

STOKE-UPON-TRENT GAS DEPARTMENT.

The Annual Accounts.

The accounts of the Gas Department of the Stoke-upon-Trent Corporation for the year ended the 30th of March have been issued. They show that the sale of gas for private and public purposes produced a revenue of £16,114, that the disposal of residuals brought in £3940, and that the total receipts amounted to £20,669. The expenditure on the manufacture of gas was £10,427; on distribution, £2135; on management, £638; and other items made the total expenses £15,916—leaving a balance of £4753 to go to the profit and loss account. The total of this account on March 30 was £4865; and having met the loan repayments and interest (£3355), &c., there was a balance of £684, of which £642 has been applied in relief of the district rate. The net profit was equal to 1·24d. per 1000 cubic feet of gas sold; whereas for the year 1908-9 there was a deficit equal to 1·77d. Appended to the accounts is a working statement which shows that, under the supervision of the Gas Engineer and Manager (Mr. William Prince), 11,754 tons of coal were carbonized and 144,303,000 cubic feet of gas made, inclusive of that in stock. Of this quantity, 132,789,900 cubic feet, or 92·02 per cent., were sold, 1,693,200 cubic feet, or 1·17 per cent., were used on the works and in the offices, and 9,819,900 cubic feet, or 6·81 per cent., were unaccounted for. The make of gas per ton of coal was 12,304 cubic feet, of which 11,291 cubic feet were sold. The production of residuals per ton of coal was: Coke, 12½ cwt.; tar, 10·96 gallons; ammoniacal liquor, 21·95 gallons. The net proceeds of the residuals were 63·09 per cent. on the cost of the coal.

RHYL DISTRICT COUNCIL GAS SUPPLY.

The Past Year's Working.

The Gas Engineer and Manager of the Rhyl Urban District Council (Mr. Leonard G. Hall) has reported to the Gas Committee the results of the working in the year ended the 31st of March last. In this period, the make of gas for the first time exceeded 60 million cubic feet; while the sale showed a considerable increase—viz., 2,943,000 cubic feet. The unaccounted-for gas decreased from 8·39 to 8·21 per cent. of the make. The gas made per ton of coal carbonized was 11,508 cubic feet; and the gas sold, 10,425 cubic feet. These are the highest figures in the history of the undertaking. The gross profit was £4525; and after paying interest and charges connected with the redemption of loans (£2743), a net profit of £1782 was available for the relief of rates. The coke sold per ton of coal carbonized was 9¾ cwt.; but the boiler is heated by coke fuel, and if credit be taken for this, the sales were more than 10½ cwt. per ton of coal carbonized. The receipts for tar and liquor increased by £62; the yield of ammoniacal liquor per ton of coal carbonized being exceptionally high. The actual net cost of gas into the holders—including coal, purifying, salaries, carbonizing wages, repair and maintenance of plant, less residuals—works out at a slight fraction over 1s. per 1000 cubic feet of gas made. When Mr. Hall took over the management of the gas-works in 1893, the capital charges per 1000 cubic feet of gas made per annum were upwards of 1s. 6d.; whereas now they are 10·94d.

Accompanying the report is a tabulated statement of the moneys received and paid since 1893. It shows that in the past eight years a net profit of £10,729 has been realized. The working statement shows that the quantity of gas sold to private consumers was 49,108,700 cubic feet, and for public purposes 5,362,100 cubic feet; making a total of 54,470,800 cubic feet. The quantity of coal carbonized was 5225 tons; and the residuals produced were: Coke, 3331 tons; tar, 61,960 gallons; ammoniacal liquor, 190,556 gallons.

MANSFIELD GAS-WORKS EXTENSIONS.

Money for a Water-Gas Plant.

On behalf of the Local Government Board, Mr. R. H. Bucknell last Wednesday held an inquiry into an application by the Mansfield Corporation with regard to the borrowing of £7000 for the purpose of providing a water-gas plant. It was stated that the population served by the gas-works totalled 50,000, made up of 35,000 at Mansfield, 10,000 at Mansfield Woodhouse, and 5000 at Pleasley. The outstanding loans on the undertaking were £97,000.

The Engineer and Manager (Mr. Arthur Graham) said that when he was appointed by the Mansfield Corporation seventeen years ago, the make of gas was a little over 60 million cubic feet. It had increased until for the year ended March 31 last it was over 156 millions—this being an increase of 8 millions on the preceding year. In the past ten years, the increase has been over 61 million cubic feet, or 64 per cent. At the works there was one retort-house with 110 through retorts; and during last winter every retort was in use at the same time. He estimated the yield at about 7000 cubic feet per mouthpiece per day of 24 hours—say, a maximum of 800,000 cubic feet per day. On Dec. 22, there was an output of 746,000 cubic feet; and there was no doubt that 800,000 cubic feet would be reached during the coming winter. The maximum last winter over the previous winter for a day's consumption was 70,000 cubic feet. This would be considerably increased if there was a very severe winter. The Corporation supplied Mansfield, Mansfield Woodhouse, and part of the parish of Pleasley, all of which districts were rapidly increasing at the present time. In Mansfield alone, some 400 new houses per annum were certified fit for habitation. It was absolutely essential that additional gas-making plant should be provided without delay, if the supply of gas was to be maintained. In November last, a Sub-Committee were appointed to deal with the question. They visited several towns, and came unanimously to the conclusion that it was desirable to instal a carburetted water-gas plant; the capital expenditure being only about half that of putting down an ordinary coal-gas plant of the same capacity. Further, there was at the gas-works a disused building, formerly a purifying-house, which could, with slight alterations, be made suitable for the plant. The recommendation of the Sub-Committee was approved by the Committee and the Town Council, and tenders were secured for the plant—that of Messrs. Humphreys and Glasgow being accepted. He estimated that it would be about seven years before further gas extensions would be necessary.

The Inspector suggested a reduction of the loan by £500, as he thought the amount put down for contingencies was too much, considering that the contracts had already been let. The contingencies allowed for amounted to £620; and he was of opinion that £120 would be sufficient.

Mr. T. Smith (the Chairman of the Gas Committee) urged upon the Inspector the necessity of the loan being granted at the earliest possible moment, and said that not a halfpenny more than capital cost would be expended.

PUBLIC LIGHTING OF OSWESTRY.

Gas Beats Electricity.

At the Monthly Meeting of the Oswestry Town Council, a report of the Watch Committee came up for adoption which recommended that the tender of the Gas Company for the public lighting of the streets of the borough for a period of seven years from Oct. 1, 1910, at £3 per single-burner lamp, and £3 17s. 6d. per double-burner lamp per annum, be accepted, subject to an agreement being entered into.

The Town Clerk (Mr. S. P. Parry), previous to the discussion of the report, read the tenders that had been received from the Gas and Electric Light Companies. The Gas Company tendered to light single-burner lamps for £3 per annum and double-burner lamps for £3 17s. 6d., for a period of seven years from Oct. 1; the times of lighting, candle power, &c., to be as under the present agreement, and in accordance with the Council's specification. The tender of the Electric Light Company was as follows: "This Company will provide and maintain during the seven years beginning on Oct. 1, 1910, 44 double-burner lamps in the main streets, each of such lamps being 100-candle power, for the sum of £3 10s. per annum. Or if the Corporation undertake the cost of installation, the Company will supply current to, and maintain, 44 double-burner lamps of 100-candle power each and 208 single-burner lamps of 50-candle power each, for the sum of £2 5s. per annum for each double-burner lamp and £1 15s. for each single-burner lamp. We estimate that the total annual cost to the Corporation of accepting the alternative tender would not exceed £630 per annum during the seven years; while at the close of that period, the whole of the installation would be the paid-for property of the Corporation, and, if the tender were renewed on the same terms, the annual cost of lighting would then be only £463."

An amendment was moved by Mr. Vaughan to the effect that, instead of accepting either tender, they should ask for fresh offers. He expressed the opinion that they should not renew their agreement with the Gas Company, if it could be shown that they could light the town for less.

Alderman Whitfield said he did not think there was room for more than six large electric lamps in the town. Oswestry, with its narrow streets, could not be compared with Llandudno, Rhyl, and Aberystwyth, where they had wide streets and long promenades well lighted by electricity. Oswestry, with these electric lamps, for the reason he had stated, could not get 50 per cent. of the advantage that they obtained from them in big places. Hence, in his opinion, it would be madness to light the narrow streets of the town with high candle-power lights. Mr. Sheather, too, pointed out that, though the two Companies were asked to tender to a certain specification, only one of them—the Gas Company—complied with the terms. Therefore, however much they would like to see the streets lighted by electricity, it was for the present outside the range of practicability.

The discussion was continued by Mr. Daniel, who remarked that, had the Electric Light Company conformed to the specification drawn up by the Town Council, and submitted their tender on exactly the same lines as the Gas Company, they would have been better able to discuss the matter on its merits, and, without very much difficulty, to settle which of the two tenders was the cheaper. Unfortunately, the Electric Light Company had only tendered to supply 44 lamps; while, as to the remainder, it was suggested that the town should supply themselves, not only with the lamps, but the cable also. To do this would be a costly business; and they had not the money. Further, before they could undertake the work, they would have to apply to the Local Government Board for permission to borrow the necessary money. As a preliminary to this, an inquiry would have to be held; and there could be no doubt that the strongest opposition would be raised to it, while he very much questioned whether the Local Government Board would in the end give them the required permission at all. Then there was the further difficulty—and it was an insuperable one—that, if they did instal this plant, they would be committed to the Electric Light Company for all time. The plant would be theirs; and what could they do with it if they did not continue to use the electric light? Why, their second position would be worse than their first; for they would then be under the Electric Light Company's finger and thumb. Of course, he recognized that the Electric Light Company had rendered the town good service by securing for them better terms from the Gas Company. Having gone into the matter very carefully, he felt sorry to have to say that he considered the tender of the Electric Light Company an impossible one.

Mr. Daniel suggested that the contract be for three years instead of seven years. Mr. Sheather: How can we, after inviting the two Companies to tender for seven years, expect any business concern to entertain such a proposal? The Mayor pointed out that the seven years' period was fixed by the Council before the tenders were invited. They could not therefore go back on it.

The report of the Committee was then adopted.

RHYMNEY VALLEY WATER SUPPLY.

A further conference in connection with the proposed Water Board for the Rhymney Valley was held some days ago at Hengoed, when Messrs. Wilcox and Raikes, of Birmingham, submitted a report on the investigations that had been made to ascertain the best means of providing for the future water supply. They stated that they had considered the existing system of supply, and had examined the various alternative sources from which it seemed possible that a supplementary supply might be obtained. Having regard to the very rapid increase that was likely to take place in the Rhymney Valley, they had based their calculations on the assumption that provision should be made for three times the present population of 75,000. Under the Rhymney and Aber Valleys Gas and Water Act, 1898, the Company obtained power to construct two reservoirs to the north of Rhymney Bridge; but they found one of the reservoirs had not been constructed, and at the time of their inspection reservoir No. 2 was nearly empty. It seemed evident that the demand exceeded the supply available; and they had satisfied themselves that the supply of water obtainable from the gathering ground north of Rhymney Bridge Station was totally inadequate to meet the present and prospective needs. Having ascertained that a supplementary supply is already being obtained from Merthyr, they had investigated the possibility of securing a further supply from the same source. In their inspection, they examined the site of a reservoir that was at one time proposed for the borough of Merthyr, in the lower part of the Taf Fechan Valley. The proposal to construct the reservoir was abandoned owing to the uncertainty which then existed as to whether the large surplus supply could be utilized by neighbouring districts. There could be no question that this was one of the finest sites for a reservoir in South Wales; and the cost of constructing it would be remarkably low in proportion to the supply that might be obtained. So that if the difficulty previously anticipated by the Merthyr Corporation could now be removed, they were confident that it would afford by far the most economical and satisfactory source from which to obtain the additional water that must very shortly be provided for the Rhymney Valley as well as the borough of Merthyr. The works that would have to be constructed to obtain an ample supply of water for the Rhymney Valley would be a dam near Pontsticill Station and a new main to connect with the mains in the Rhymney Water Company's area near Treharris. As the whole of the works would be equally useful to the borough of Merthyr, they had no reason to doubt that the Corporation would be quite ready to co-operate with the Rhymney Valley authorities in their construction for the mutual advantage of all concerned. They ascertained that the estimate prepared by Mr. G. F. Deacon in 1908 for the Taf Fechan reservoir, together with low-level mains and filters approximately corresponding in capacity with those they recommended, amounted to £350,000. If this expenditure were apportioned according to the volume of water taken, the contribution of the Rhymney Valley would amount to about £112,000 for 4½ million gallons per day out of 14 million gallons available. To this should be added about £18,000 for a service reservoir and further mains; so that the total expenditure devolving on the Rhymney Valley would be £130,000. The conference decided to recommend to the various Councils concerned the adoption of the report; and a Committee was appointed to meet the Merthyr Corporation, with a view to arranging for joint action.

PORT OF LONDON RATES.

Gas Companies' Opposition Withdrawn.

The Port of London (Port Rates on Goods) Provisional Order came before a Select Committee of the House of Commons presided over by Sir LUKE WHITE, on Tuesday last.

The Hon. J. D. FITZGERALD, K.C., in the course of his opening statement on behalf of the Port of London Authority, reviewed the position resulting from the Board of Trade inquiry held before Lord St. Aldwyn* and his report to the Department, and went through the various sections of the Order now before the Committee. He mentioned certain provisions of the Order in favour of exports coastwise; the rates on coastwise goods being limited to half of the rates on goods imported from overseas. It was provided that the port rates charged on coal, culm, &c., exported coastwise should not exceed half the port rates for the time being actually charged for coal, culm, &c., imported coastwise. Bunker coal represented about 1½ million tons a year; and on that imported into the Port of London and used for bunkering purposes, no rate would be charged at all, or, if it was charged in the first instance, it would be refunded if used for bunkering. But with regard to coal generally, the position was this—that whether imported or exported, the maximum rate was 2d. a ton. The parties chiefly interested in the coal trade of London—the waterborne coal to the port—were the gas companies. They got practically all their coal by water. The next parties interested were Messrs. Cory and Co., who had a very large proportion of the coal traffic in the river. They partly dealt with coal imported for the gas companies, and also with that imported for other purposes. He believed it was something like 5 million tons that they dealt with in the course of the year. Neither the gas companies nor Messrs. Cory and Co. were continuing their opposition to the Bill. He thought they recognized that their case was fully and fairly heard at the public inquiry, and that in fixing the maximum rate at 2d. a considerable reduction had been made, because as the original schedule stood it worked out at a maximum rate of 3d. on coastwise coal. There were other opponents in connection with the rates on coal representing northern coalowners; but he was unable to say whether the fair and patriotic attitude of the companies he had named would be adopted by them.

* See "JOURNAL," Vol. CIX., pp. 746, 827.

Suicide by Gas at Royston.—A miner named George Mee, of Royston, who is reported to have been drinking heavily for some time, was found by his son lying on the bed dead. There was a strong smell of gas in the room; and it was found that the deceased had connected a rubber tube to the gas-burner, and apparently inhaled the gas.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 95.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,474,000	Stk.	Apl 1	5	Alliance & Dublin Ord.	81–83	–1	6 0 6
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	100–'02	..	3 18 5
200,000	5	May 12	7	Bombay, Ltd.	6⅞–6¾	..	5 9 10
40,000	5		7	Do. New, £4 paid	4⅛–5⅛	..	5 9 3
50,000	10	Feb. 25	15	Bourne- mouth Gas and Water Pref. 6 p.c.	29–30	..	5 0 0
311,810	10	,,	7		16¼–16⅝	..	4 3 7
75,000	10	,,	6		15–15½	..	3 17 5
380,000	Stk.	,,	12½	Brentford Consolidated	251–254	..	4 18 5
300,000	,,		9⅜	Do. New	188–190	..	5 0 0
50,000	,,	Aug. 12	5	Do. 5 p.c. Pref.	120–122	..	4 2 0
206,250	,,	June 10	4	Do. 4 p.c. Deb.	99–101	..	3 19 3
220,000	Stk.	Mar. 16	11	Brighton & Hove Orig.	214–217	..	5 1 5
246,320	,,	,,	8	Do. A Ord. Stk.	153–156	..	5 2 7
460,000	20	Apl. 1	10⅝	British	44–45	..	4 14 8
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	118–120	..	5 0 0
165,700	,,	,,	4½	Do. B 3½ p.c.	88–90	..	5 0 0
82,278	,,	,,	5⅛	Do. C 5 p.c.	105–107	..	5 2 10
54,000	,,	June 29	3½	Do. 3½ p.c. Deb.	85–87*	..	4 0 6
250,000	Stk.	June 29	4	Buenos Ayres 4 p.c. Deb.	96–98*	..	4 1 8
100,000	10	—	—	Cape Town & Dis. Ltd.	3–4	–½	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5⅛–6½	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49–50	..	6 0 0
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	88–90*	..	5 0 0
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109–111	..	4 10 1
1,513,280	Stk.	Feb. 25	5⅝	Commercial 4 p.c. Stk.	107–109	..	4 15 5
560,000	,,	,,	5	Do. 3½ p.c. do.	103–105	..	4 15 3
475,000	,,	June 29	3	Do. 3 p.c. Deb. Stk.	80–82*	..	3 11 2
800 000	Stk.	June 10	5	Continental Union, Ltd.	91–95	–1	5 5 3
200,000	,,	,,	7	Do. 7 p.c. Pref.	135–137	..	5 2 2
492,270	Stk.	—	5½	Derby Con. Stk.	121–123	..	4 9 5
55,000	,,	—	4	Do. Deb. Stk.	104–105	..	3 16 2
148,995	,,	Apl. 1	5	East Hull 5 p.c. Ord.	96–98	..	5 2 0
486,090	10	Jan. 27	12	European, Ltd.	24½–24⅝	..	4 17 0
354,760	10	,,	12	Do. £7 10s. paid.	18½–18⅝	..	4 16 0
16,198,671	Stk.	Feb. 10	4⅝	Gas light and Coke	4 p.c. Ord.	104½–105½	+½	4 8 5
2,600,000	,,	,,	3⅛		3½ p.c. max.	88–90	..	3 17 9
4,002,235	,,	,,	4		4 p.c. Con. Pref.	104–106	..	3 15 6
4,531,706	,,	June 29	3		3 p.c. Con. Deb.	80–82*	..	3 13 2
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.		93–95	..	5 5 3
82,500	,,	,,	6⅛	Do. do. 5 p.c.		117–119	..	5 9 3
70,000	10	Apl. 29	11	Hongkong & China, Ltd.		17–17⅛	..	6 5 9
131,000	Stk.	Mar. 16	7	Ilford A and C		145–147	..	4 15 3
65,780	,,	,,	5⅜	Do. B		109–111	..	4 19 1
65,500	,,	June 29	4	Do. 4 p.c. Deb.		98–100*	..	4 0 0

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
4,940,000	Stk.	May 12	8	Imperial Continental	178–180	..	4 8 11
1,235,000	Stk.	Feb 10	3½	Do. 3½ p.c. Deb. Red.	94–96	..	3 12 11
195,242	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	122–124	..	4 16 9
561,000	Stk.	Feb. 25	10	Liverpool United A.	219–221	..	4 10 6
718,100	,,	,,	7	Do. B	164–165	..	4 4 10
306,083	,,	June 29	4	Do. Deb. Stk.	104–106*	..	3 15 6
75,000	5	June 29	6	Malta & Mediterranean	4⅛–4⅜*	..	6 4 8
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	100–102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100–102	..	4 8 3
541,920	20	May 27	3⅜	Monte Video, Ltd.	12½–13	..	5 7 8
1,775,892	Stk.	Feb. 25	4⅜	Newc'tle & G'tesh'd Con	103–104	+½	4 4 2
529,435	Stk.	June 29	3⅜	Do. 3½ p.c. Deb.	89–91*	..	3 16 11
55,940	10	Feb. 25	7	North Middlesex 7 p.c.	13¾–13⅞	..	5 1 10
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	138–140	..	5 14 4
60,000	5	Apl. 1	8	Ottoman, Ltd.	6–6¼	..	6 8 0
31,800	53	Feb. 25	13	Portsea Island A.	134–136	..	5 1 0
60,000	50	,,	13	Do. B.	126–128	..	5 1 7
100,000	50	,,	12	Do. C.	119–121	..	4 19 2
114,800	50	,,	10	Do. D and E.	100–102	..	4 18 0
398,490	5	Apl. 29	7	Primitiva Ord.	7¼–7⅝	..	4 13 4
796,980	5	June 29	5	Do. 5 p.c. Pref.	5¼–5⅜*	..	4 10 11
488,900	100	June 1	4	Do. 4 p.c. Deb.	97–99	..	4 0 10
312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.	97–99*	..	4 0 10
250,000	10	Apl. 1	9	San Paulo, Ltd.	15⅝–16¼	+¼	5 10 9
62,500	10	,,	6	Do. 6 p.c. Pref.	11¾–12¼	..	4 18 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49–50*	..	5 0 0
135,000	Stk.	Mch. 16	10	Sheffield A	234–236	+2	4 4 9
209,984	,,	,,	10	Do. B	234–236	+2	4 4 9
523,500	,,	,,	10	Do. C	233–235	+1	4 5 0
70,000	10	May 27	7	South African	11–11⅛	..	6 1 9
6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	120–122	..	4 9 7
1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	80–82	..	3 13 2
209,820	Stk.	Mar. 16	8	South Shields Con. Stk.	157–158	..	5 1 3
605,000	Stk.	Feb. 25	5⅜	S'th Suburb'n Ord. 5 p.c.	121–123	..	4 12 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	121–123	..	4 1 4
117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	122–124	..	4 0 8
502,310	Stk.	May 12	5	Southampton Ord.	110–112	..	4 9 3
120,000	Stk.	Feb. 10	6⅞	Tottenham A 5 p.c. and B 3½ p.c.	133–135	..	5 1 9
453,940	,,	,,	5⅜		113–115	..	4 13 6
149,470	,,	June 29	4	Edmonton 4 p.c. Deb.	97–99*	..	4 0 10
182,380	10	June 10	8	Tuscan, Ltd.	9–9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97–99*	..	5 1 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p c max.	113–115	..	4 6 11
255,636	Stk.	Feb. 25	6⅞	Wands- B 3½ p.c.	139–141	..	4 14 0
79,416	,,	June 29	3	worth 3p.c. Deb. Stk.	73–75*	..	4 0 0

Prices marked * are "Ex div."

GAS AND ELECTRICITY SUPPLY IN MASSACHUSETTS.

The last number of the "American Gaslight Journal" contains an article by Mr. H. Thurston Owens on the twenty-fifth annual report (for 1909) of the Massachusetts Board of Gas and Electric Light Commissioners. It shows that the number of private companies making returns was: Gas, 42; electricity, 57; combined, 45—total, 144. The municipal plants were: Electricity, 20; combined, 4—total, 24. There were twenty applications to the Commissioners for permission to issue stocks and bonds to the total amount of $7,398,755; and they were all granted. The income derived from the different plants last year is shown below; the figures for 1908 being given for comparison.

	1908.		1909.
Gas companies	$10,433,307	..	$10,871,534
Electricity companies	10,401,550	..	10,558,069
Municipal gas plants	251,638	..	261,217
Municipal electricity plants	503,380	..	579,406

The increase in the income of the gas companies was nearly three times that of the electricity companies; the major portion of it in the case of the former being in sales of gas by meter, which represent nearly 89 per cent. of the total income, or about the same as in former years. The receipts from sales for public lamps show an increase of upwards of $11,000.

The expenses connected with the different plants in the two years are shown below:—

	1908.		1909.
Gas companies	$7,690,012	..	$7,668,868
Electricity companies	6,145,599	..	6,279,046
Municipal gas plants	180,167	..	186,357
Municipal electricity plants	512,504	..	544,779

While gas companies show the largest increase in income, they are also the only ones to show a decrease in expenses. In the report, the expenses are divided into 27 items; and of these 11 are smaller than those for the preceding year. They include coals and enrichers, repairs and maintenance of works, and repairs, renewals, and maintenance of mains and services. The principal item of increase was in gas bought, which rose from $814,000 to $879,000; whereas the income from gas sold to other companies decreased from $491,000 to $450,000.

East Surrey Water Company.—At the recent annual general meeting of this Company, the report of the Directors, noticed in the "JOURNAL" for the 28th ult., was unanimously adopted. At a subsequent extraordinary meeting, the Directors were authorized to create and issue by tender 700 ordinary shares of £10 each. Thanks were accorded to the Directors and staff; and on behalf of the latter acknowledgment was made by Mr. A. E. Cornewall-Walker, Assoc.M.Inst.C.E., the Engineer, Manager, and Secretary.

ELECTRIC LIGHTING AT HASTINGS.

The Hastings Town Council recently had before them the annual accounts of the Electricity Department; and, in moving their reception, Mr. Stace said that the public lamps had cost £31 more, but they produced £662 more income; so that this item had been a good investment. The gross profits last year were £7334, whereas this year they were £7923. The deficiency now was £2919, or £882 less than that of last year. The raising of the price per unit had not resulted in the benefit the Committee had anticipated. The average price in 1908-9 was 5d. on 616,269 units. Last year 569,848 units produced an average of 5·55d. The increased price had precipitated economy. Since 1902 they had improved the machinery, and brought it up to date. They had duplicated it, extended and renewed the cables, and improved the public lighting. [Laughter and a Voice: That's risky.] He thought there was no question that it had been very much improved. The electric light undertaking to-day was a far more valuable asset to the town than it was in 1902. Mr. Stace next dealt with the estimates for the forthcoming year, and said an additional income of £1000 was anticipated. Mr. Warner, referring to the increase of 163 consumers, asked how it was the quantity of current used was so much less than before. Mr. Stace suggested that the question should be taken down and put to the Engineer. Mr. Cox asked what was the cost per unit, and remarked that every member of the Council ought to know what it cost to produce electricity. Alderman Tree pointed out that Mr. Cox could easily have answered himself by making a little calculation. The cost of generation was £5590; and if this amount were divided by the number of units generated, the cost per unit could be easily ascertained. In 1908-9, there were 899 customers; and an average consumption of 760 units. Last year there were 1067 customers; but the average consumption was only 534 units. Though the average amount consumed was 226 units less, they had far better illumination than in 1908. Dr. Gray said the total cost of generating current was 1·83d. per unit, and the cost of generation, distribution, and all other expenses, except loan and sinking fund charges, was 4·89d. The total cost per unit was 6·73d. Mr. Cox said if the Electricity Committee adopted his suggestion, and charged a proper price for current, they would not have continued for fifteen months making a loss on the quantity used. They had an increased number of consumers and of lamps, all of which they would have had fifteen months before if the Committee had only been reasonable then. Mr. Stace having replied, the accounts were adopted.

Reduction in Price at Knaresborough.—The Knaresborough Urban District Council have resolved to reduce the price of gas 2d. per 1000 cubic feet, which will mean, with the allowance of 5d. for prompt payment, 2s. 9d. per 1000 cubic feet for lighting purposes and 2s. 4d. for cooking and heating.

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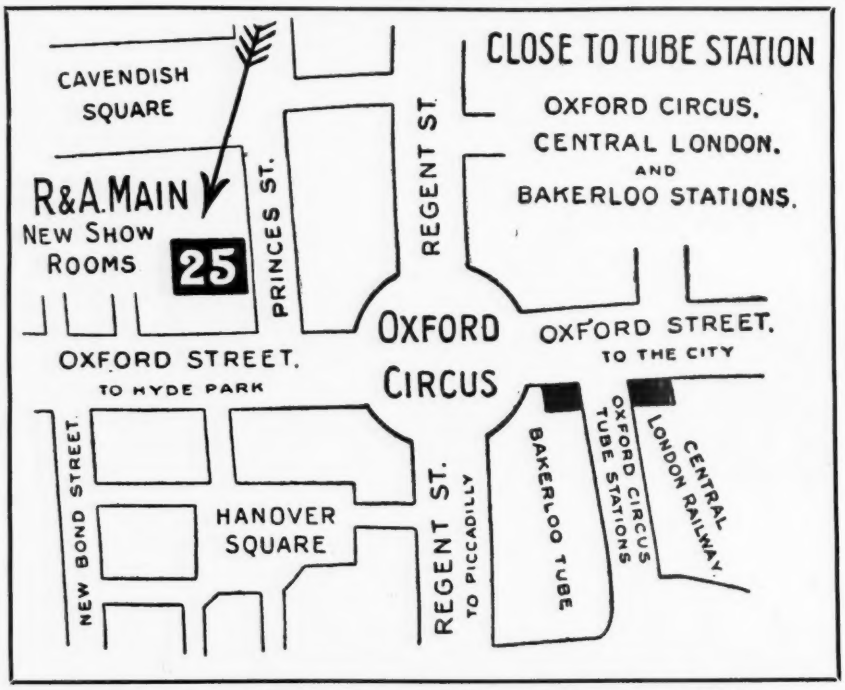

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MUNICIPAL ENGINEERS AND WATER SUPPLIES.

Among the subjects before the Incorporated Association of Municipal and County Engineers at their meeting held at Plymouth, under the presidency of Mr. J. Paton, the Borough Engineer of the town, was a paper by Mr. Frank Howarth, M.Inst.C.E., the Water Engineer of Plymouth, on the Plymouth water undertaking.

In his communication, the author sketched the history of the Plymouth undertaking from its foundation in the time of Queen Elizabeth, pointing out that the supply is noteworthy, not only because of its being one of the oldest municipal water undertakings in England, but because of its association with Sir Francis Drake, who constructed the leat by which the water was brought to Plymouth. The present works comprise a storage reservoir at Burrator, five service reservoirs, trunk and distribution mains and leat, and hydraulic ram pump for an outside district. A remarkable feature about the watershed is the large dry-weather flow. Daily gaugings of the River Meavy, from which the supply is derived, show that in a quarter-of-a-century the lowest flow recorded was for seven days in the summer of 1887, when it was at the rate of 2,878,000 gallons in 24 hours, or 1091 cubic feet per second per 1000 acres from an area above the point of gauging of 4885 acres. Mr. Howarth remarked that he had had considerable experience of drainage areas in Yorkshire on the millstone grit and limestone formations, and is well acquainted with areas in Wales and the Thames Valley, &c.; but he has heard of no yield per 1000 acres from any watershed equal to this in the driest summer weather. The only ones within his knowledge to approach it are similar granite areas on Dartmoor and in Cornwall. The explanation given is that the fissures in the granite, assisted by the soft and retentive nature of the surface of the ground, serve to store up the winter rainfall in a natural reservoir, and to pass it out gradually in the summer time. Continuous observations, taken since 1892, show an average rainfall of 55·78 inches; and from July, 1906, to July, 1909, the average flow from the watershed was over 14,000,000 gallons per day, and the lowest flow was at the rate of 3,140,000 gallons per day.

The drainage area above the point where the recording station is fixed is 4554 acres. The quality of the water is excellent, and it is not filtered. It is remarkably soft, having less than 1° of hardness. The capacity of the storage reservoir is 657 million gallons; the water area, when full, being about 120 acres. Under ordinary conditions, the water, before entering the trunk main, passes into a screening chamber fitted with fine screens of copper gauze of 400 mesh. The trunk main, to the first service reservoir at Roborough, is of cast iron, 25 inches internal diameter, and varies in thickness of metal from 0·82 inch to 1·125 inches, according to the pressure it has to bear. The length of the main is 4 miles 662 yards. When laid in 1894, it was capable of delivering 8 million gallons per day; but this has now been reduced, through corrosion and sediment, by over 10 per cent. Between the first service reservoir at Roborough and the second one at Crownhill, are two lines of mains, each consisting of 3628 yards of 24-inch, 1133 yards of 20-inch, and 373 yards of 18-inch pipes. A 24-inch main conveys the water to the third service reservoir at Hartley; and there is a fourth reservoir at Drake's place which supplies the lower portion of the town. Within the administrative area there are 20 miles of trunk mains and 115 miles of distribution mains. Of these, 70 miles have been added during the last 20 years; and in the same time about 27 miles of the older mains have been renewed.

For the prevention of waste, the Corporation have adopted various means. All new fittings are thoroughly examined and tested free of cost at the water-works yard to a pressure of 350 lbs. per square inch; while no connections are made to new property until the internal fittings have been passed by an inspector who is by trade a practical plumber. Wrought-iron pipes for internal fittings are not allowed by the regulations, as the water very quickly sets up corrosion. All draw taps and ball taps are washered by workmen employed by the Corporation free of charge to the consumer. The administrative area is divided into 70 districts, some of which are governed by Deacon meters, two by Kent meters, and some by ordinary Siemens meters. As a result of night inspections, the consumption has been reduced from 44·20 gallons per head per day in 1902-3 to 37·83 gallons in 1908-9. The charges for water within the borough of Plymouth are among the lowest in the country; the scale ranging from 4s. for a house of the yearly rent not exceeding £5 and 14s. for a house whose rental is between £15 and £20, to 40s. for a house over £80. For trade purposes, by meter, the charge is 3½d. per 1000 gallons. Notwithstanding the very low charges prevailing, it has been usual for a considerable period for the undertaking to hand over a substantial sum in aid of the rates; the amount for the year ending March, 1909, being £5510. During the last six years, the sum given in aid of rates was £28,948. The total capital expenditure to March 30, 1909, including expenses of stock issues, was £392,336, and the total amount repaid or in the redemption fund was £111,888.

Mr. Brodie, in the course of the discussion, referred to the reduction in the consumption of water at Gloucester, and said that, under Mr. Read's management, it had been brought down from 32 gallons per head per day in 1883 to 20 gallons at present. He thought the time would come when water would be supplied to all houses by meter, and no one would think of supplying on the rateable value of houses.

Mr. T. Caink (Worcester), referring to the fact that the Plymouth water supply is not filtered, said he had made some investigations with regard to the hygienic quality of water supplies, comparing towns obtaining water from mountain lands or artesian wells with towns getting water from rivers and having perfect filtration arrangements. The net result of his investigations was to show that those towns which got their water supply from rivers had an emphatically lower typhoid case rate than towns deriving their supply from any other source. There was one remarkable exception; and that was Plymouth. While other towns with upland supplies showed a case rate four or five times greater

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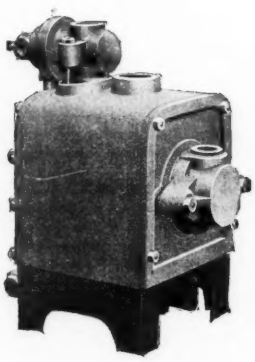

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than towns supplied with river water, Plymouth was as low as any of the river supplied towns. His impression was that Plymouth had one of the finest water supplies in the world. But however pure a water supply might be, he was still of opinion that, when taken from exposed areas, it was not perfectly safe to send it to the consumer without having the safeguard of passing it through efficient filters.

Sir JAMES LEMON (Southampton) compared the charges for water at Southampton with those at Plymouth, and claimed equality of cheapness for his town. He thought the Corporation of Plymouth were in the wrong in making a profit out of the water. They should reduce the charges or allow a liberal scale of discounts.

Mr. HOWARTH, replying to a remark by another speaker, said that, notwithstanding the moorland origin of the water, there was no action by it on lead pipes. As to filtration, he was inclined to agree generally with Mr. Caink; but the supply seemed to be an exceptional one. The Town Council would tell them that the fact that their ancestors had drunk the water for 300 years was a good test of its purity. Filtration would improve it; but it was difficult to get the people who had to find the money to incur the cost. The question of profit was another matter on which the Town Council had opinions. They would like to make enough profit to pay all the rates of the town; and if they charged as much as some towns, they would do it.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The seventy-sixth annual meeting of the Galashiels Gaslight Company, Limited, was held on Tuesday last—Mr. Jas. Dickson, the Chairman, presiding. The report of the Directors showed that the profit for the year had been £2299, and that the reserve at June, 1909, was £7108—making together, £9407. It was recommended that a dividend of 10 per cent., free of income-tax, be paid, which would require £2100, and that £7307 be placed to reserve. The gas made during the year was 74,620,000 cubic feet, the quantity unaccounted for 3,398,328 cubic feet, and that used in works and offices 746,200 cubic feet. The quantity which passed through consumers' meters was 70,475,472 cubic feet—an increase upon the preceding year of 2,733,039 cubic feet. The Directors recommended that the price of gas be retained at 2s. 9d. per 1000 cubic feet. They reported that the ammonia distillery carried on by Messrs. Metcalf, Limited, near the gas-works, had been acquired by the Gas Company. The report was adopted.

The annual report of the Directors of the Kirkcaldy Gaslight Company, Limited, which has been issued, states that during the past year the quantity of gas made was 147,881,000 cubic feet. This is nearly a million cubic feet more than in the previous year. The gross profit for the year, before charging interest on the reserve and depreciation funds, was £6504. For the year ending Nov. 30 last, an interim dividend of 4s. per share was paid. The Directors recommend that a final dividend of 4s. 6d. per share be paid, which will absorb £2940. The Directors have resolved to continue the price of gas to ordinary consumers at 3s. 2d. per 1000 cubic feet. In regard to the purchase of the Company's undertaking by the town, the Directors report that the books are still in the hands of the accountant employed by the town. If an offer be made which the Directors can recommend for acceptance, they will at once call the shareholders together. If, however, no such offer be received within a reasonably short time, the Directors will have no option but to resort to arbitration.

The annual general meeting of the Lochgelly Gas Company, Limited, was held last Wednesday. The Directors' report and balance-sheet was unanimously agreed to. It was reported that 33½ million cubic feet of gas were manufactured during the past year—an increase of nearly 7 millions over the previous year. The Chairman mentioned that about one mile of the new main pipe and about 3½ miles of service-pipes had been laid during the year. A dividend of 7½ per cent. was declared, £400 is to be put to the reserve, and £490 carried forward. The price of gas has been reduced by 2½d. per 1000 cubic feet.

The Gas Committee of the Dunfermline Town Council have had before them a letter from a firm of solicitors, on behalf of Mary Murphy, a factory worker, of Golfdrum Street, with reference to injuries which she had sustained through being poisoned by gas in her dwelling-house. It was pointed out that on more than one occasion complaint had been made at the gas office of an escape, but no attention was paid to it. Damages were accordingly claimed. The Committee deny liability, and point out that there is no obligation on the part of the Corporation to act as plumbers.

The annual meeting of the Anstruther and Cellardyke Gas Company, Limited, was held on Wednesday. The Chairman—Mr. W. Oliphant—said the Company had had a very successful year; the profit having been £752. The balance brought forward from the previous year was £260; making a total of £1012, out of which the Directors set aside £285 for depreciation, and £35 as irrecoverable arrears, reducing the balance to £692. A dividend of 5 per cent. was declared, and the balance of £367 was carried forward.

The Kinross Gaslight Company, Limited, had a profit on last year's working of £404, and have paid a dividend of 7½ per cent. free of income-tax. The Blairgowrie Gaslight Company have paid a dividend of 5 per cent.; and the Coupar Angus Gaslight Company have paid a dividend of 6 per cent., and continued the price of gas at 5s. 7½d. per 1000 cubic feet. The Alyth Gaslight Company have paid a dividend of 6 per cent.

On Monday evening of this week, Mr. Leitch, in submitting the accounts of the Gas Department to the Town Council of Newport, Fife, said the department was in a healthy condition. There had been an increased consumption of gas, and the unaccounted-for gas had been lower than it had been for some years. The total capital expenditure upon the works had been £24,117; and the debt at the present time amounted to £18,675—a reduction of £5442, due to the repayment of borrowed money to the extent of £3625, and the sale of old plant and

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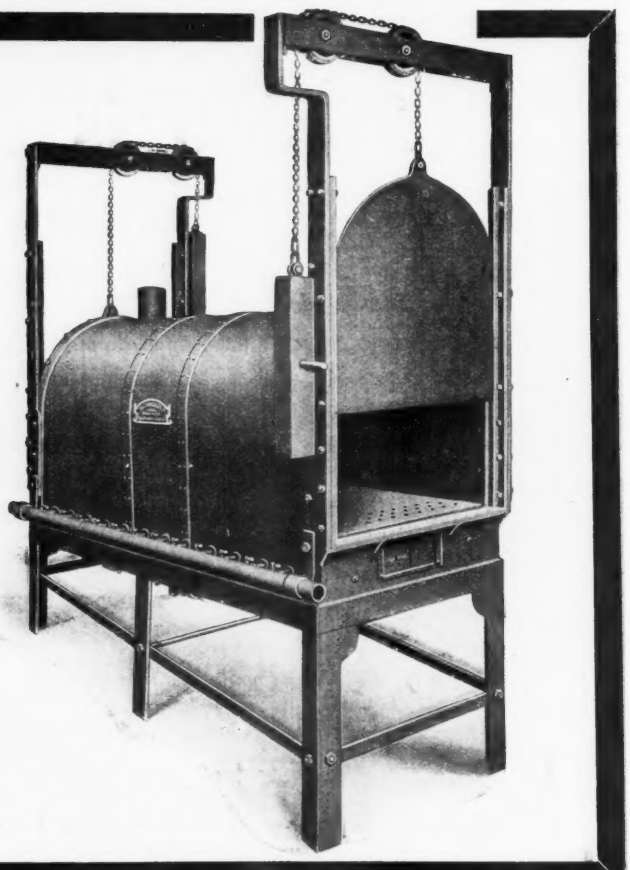

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the transfer from the depreciation fund of £1767. Mr. Leitch urged the necessity of continuing their efforts to still further reduce the valuation of the gas-works.

Early this month, the first sod of a new reservoir in connection with the water supply to Paisley was cut by Provost W. Muir Mackean. The reservoir, which is the seventh constructed since 1838, when a gravitation supply was introduced, is to be known as Barrcraigs. It is to be a mile long, half-a-mile broad, and to have a surface area of 182 acres. Its capacity is to be 1100 million gallons, which is more than the combined capacity of the two largest existing reservoirs.

In the "Glasgow Herald" it was reported recently that "satisfactory progress is being made with the Smoke Abatement Exhibition promoted by the Glasgow Corporation, which is to be held in the Victoria Road Skating Rink from Sept. 16 to Oct. 8 next. A large portion of the space available for exhibits has already been allotted, and most of the principal makers of gas appliances for domestic purposes will be represented. In connection with the exhibition, a communication has been submitted by a group of the principal makers to the Special Committee of the Corporation who have charge of the arrangements, urging that the Corporation should supply gas-fire apparatus, as well as cooking appliances, to the public on the hire system. Hitherto only the latter have been offered on hire by the Corporation. The belief is expressed that if the system were extended to gas-fires, these would be generally adopted by householders, and would become an important factor in the solution of the smoke problem."

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *July 9.*

There has been no material alteration in the situation during the week, for, though the market has been quiet, prices have been maintained at all points; supplies not being excessive anywhere. The closing quotations remain, therefore, at £11 15s. per ton f.o.b. Hull, £11 16s. 3d. per ton f.o.b. Liverpool, and £11 17s. 6d. per ton. f.o.b. Leith. Again there has been large inquiry for delivery in the forward position; but there has not been a corresponding amount of actual business done. While makers are firm at £11 17s. 6d. per ton for delivery up to the end of the year, and at £12 per ton for delivery in 1911, buyers are still endeavouring to get in at 2s. 6d. to 3s. 9d. per ton less.

Nitrate of Soda.

This article on spot is quiet; the quotations being unchanged at 9s. 3d. per cwt. for 95 per cent., and 9s. 6d. for refined quality.

Tar Products. LONDON, *July 11.*

Business in tar products continues quiet, and prices have not altered very materially during the past week. Creosote remains steady; but the volume of new trade is not great. There has been considerable business done in crude carbolic acid at an improved price for both prompt and forward delivery. Benzols are weak, and buyers expect to purchase at very low prices. Naphthas still remain steady. The market for pitch has been quiet throughout the past week, and there are sellers at 35s. per ton f.o.b. east coast ports, and at an equivalent on the west coast. Buyers will not, however, pay this price, as they find it impossible to do business on the Continent. In the majority of cases, they offer 31s. 6d. to 32s., which figures are reported to have been accepted for delivery all over next year.

The average values during the week were: Tar, 15s. 6d. to 19s. 6d., *ex* works. Pitch, London, 33s. to 34s.; east coast, 32s. 6d. to 33s.; west coast, 32s. to 33s. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 7¼d.; North, 6¾d.; 50-90 per cent., casks included, London, 7¾d.; North, 7d. to 7¼d. Toluol, casks included, London, 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3¼d. to 3⅜d.; North, 3¼d. to 3½d.; solvent naphtha, casks included, London, 1s. 3d.; North, 1s. 2½d. to 1s. 3d.; heavy naphtha, casks included, London, 11d. to 1s.; North, 10d. to 11d. Creosote, in bulk, London, 2¼d. to 2⅜d.; North, 2d. to 2¼d. Heavy oils, in bulk, 2⅜d. to 2⅝d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. 0½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, is 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market seems decidedly weak, and buyers are not very plentiful. To-day, outside London makes are quoted at £11 7s. 6d. to £11 8s. 9d. In Hull, £11 15s. is asked; and in Liverpool, £11 13s. 9d. to £11 15s. In Leith, the price quoted is £11 15s. to £11 17s. 6d.; while in Middlesbrough £11 12s. 6d. to £11 15s. would be accepted.

St. Helens and the Standard Burner Bills.—The attention of the members of the St. Helens Town Council was called by Mr. W. A. Brooks to the fact that the Gas Engineer (Mr. Samuel Glover) had received permission to give evidence on behalf of the promoters of the Gas Companies (Standard Burner) Bills. He asked what effect the Bills would have on the interests of the Corporation, and whether Mr. Glover's attendance in London would be at the expense of the town. In reply, it was explained by Mr. Grace that it was in the interests of consumers that the No. 2 burner should be adopted. There was, he said, no doubt there would be some compromise between the different corporations and the gas companies supplying them; but they thought that if there could be one standard for testing gas, it would be better for all concerned. Mr. Glover was supporting the standard they had in St. Helens; and he (the speaker) took it as a great compliment to the Gas Committee and their Engineer that he should have been asked to give evidence on such an important matter. The Mayor pointed out that if Mr. Glover was asked to give evidence, he would be paid; and his doing so would not cost the Corporation anything.

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COAL TRADE REPORTS.

Northern Coal Trade.

There is still a quiet tone in the Northern coal trade; but some collieries seem to have booked orders that give a fair amount of work at the lower prices now ruling. In the steam coal trade, best Northumbrians are from about 9s. 9d. to 9s. 10½d. per ton f.o.b., second-class steams are 9s., and steam smalls are from 5s. 6d. to 6s. 9d. The latter are in rather fuller inquiry, so that the output seems to be well taken up. In the gas coal trade, there is a slow increase in the home consumption, and the deliveries on the long contracts are a little heavier. Durham gas coals are quoted from about 9s. to 9s. 9d. per ton f.o.b. for the usual classes, according to quality, with "Wear" specials up to about 10s. 6d. Among the sales reported are some cargoes for Genoa, for three of the winter months, at 16s. per ton at that port. Several other small orders are reported at about the rates that are current in the market; but some of the gas coal collieries are now fairly well sold forward, and are inclined to stiffen their prices. In coke, the market is quiet; but gas coke is firm, owing to the limited supply at present. Good gas coke is about 15s. 6d. per ton f.o.b. on the Tyne or Wear.

Scotch Coal Trade.

Trade has been fairly active. Ell is plentiful, and the demand has not been sufficient to take up the output. Splint is in steady request, and the outputs are moving off steadily. Steam coal continues depressed. Small sorts are still in demand. The prices quoted are: Ell, 8s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 359,770 tons—an increase of 38,939 tons upon the previous week, and of 14,017 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,960,324 tons—an increase of 642,934 tons upon the corresponding period.

Water Scheme for Warrington.—The Warrington Town Council have unanimously adopted a recommendation of the Water Committee that application be made to the Local Government Board for sanction to the borrowing of £23,000 for water-works purposes. Alderman Evans, in moving the adoption of the minutes, pointed out that the Council had plenty of water, but not the means of supplying it. In certain parts of the town, it was impossible to give sufficient water for sanitary purposes. The scheme was to provide a new 18-inch main, commencing at Winwick Pumping-Station to Sankey Street. By the route he described, they would get a complete circuit. The cost of the new main was estimated at £17,000; and there would be £6000 for the purpose of improving the different systems of pipes. Mr. H. Roberts, in seconding, said they were making a good profit on the water undertaking; and he thought the proposed expenditure would be more than met by the increasing income, and that the reserve fund would in all probability remain intact.

Liquidation of the Automatic Gas-Lighter, Limited.

The Official Receiver in the winding-up of this Company has issued his report and observations to the creditors and shareholders concerned, the statutory meetings of whom were held on the 8th ult., as already recorded in the "JOURNAL." No statement of affairs has been lodged. The Company was registered in England on March 9, 1909, with a nominal capital of £60,000, divided into 58,000 ordinary shares of £1 each and 20,000 deferred shares of 2s. each. The share ledgers show that 30,000 ordinary and 19,500 deferred shares were issued as fully-paid, and 8410 ordinary and 507 deferred shares for cash. According to the ledgers, the calls unpaid amount to £7438; but the Official Receiver says it is possible that payments have been made which are not entered. The promoter of the Company was Mr. Henri Lucas, who received an allotment of 9000 fully-paid ordinary and 9500 fully-paid deferred shares for "negotiations entered into, steps taken, and expenditure incurred" with a view to the formation of the Company. A prospectus was drafted for the purpose of meeting the requirements of the English law relating to joint-stock companies; but no use was made of it. The Company was formed to purchase the patent rights in connection with an invention for lighting up gas-burners from a distance by means of a switch attachment known as the "Zenith," and also those for an appliance for the automatic lighting of advertisements by means of gas. The patent rights were owned by three manufacturers in France, who transferred them to the Company in consideration of an allotment of 19,000 ordinary and 10,000 deferred shares. The Official Receiver has not been able to obtain any books or accounts showing the extent or result of the Company's trading. On the 3rd of May last, the Tribunal of Commerce of the Seine declared the Company to be in a state of bankruptcy. The whole of the assets are in the possession of the Trustee; and their value is not known to the Official Receiver.

Cost of Public Lighting at Hackney.—An official return shows that the cost per mile for lighting the streets of the borough of Hackney by electricity is £377; while the cost per mile for gas lighting, under the new arrangement made with the Gaslight and Coke Company, will be only £74. At present 20·94 miles of streets are lighted by electricity, and 85·56 miles by incandescent gas.

The New Public Lighting Contract for Westminster.—It may be remembered, in connection with the acceptance by the Westminster City Council of the tender of the Gaslight and Coke Company for the lighting of certain west-end streets, that the Company are under an obligation to complete the installation of the lamps within twenty weeks of the date of the order to commence—viz., May 27 last. The Company have now formally requested permission to start the work of laying the mains in Victoria Street, Broad Sanctuary, Parliament Street, and Whitehall; and the Works Committee of the Council have granted the application subject to the usual sanction, and conditional on the City Engineer (Mr. J. W. Bradley, M.Inst.C.E.) being satisfied that the traffic will not be unduly interfered with.

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Gas and Electricity at Manchester.

Some reference was made at last week's meeting of the Manchester City Council to the report of the Gas Committee, in which it was proposed to accede to an application for an extension of the mains to supply gas to certain houses now being erected, "subject to the owner of the property paying the cost of fixing the stoves and meters, and providing one light in the kitchens." Alderman Walker suggested a conference between the Gas and Electricity Committees to meet these cases. Many estates, he said, were being built in which the tenants asked for electric light; it was a great aid to the letting of such property. More and more would the question arise as to what was to be done for the supply of gas for cooking and heating arrangements only, and electricity for lighting. Alderman Gibson (the Chairman of the Gas Committee) said they had arranged that a Joint Committee should go carefully into the matter. It was true the Electricity Committee had arranged with certain builders to put electricity in their houses, and no gas at all. These were Manchester citizens; and they had arranged to supply Manchester citizens with cookers free of charge. But it became a serious matter to supply cookers when no gas was being used. Therefore they were proposing that the owners should pay the cost of fixing the stoves, and should have one gas-light in the kitchen, which would consume a sufficient amount to pay principal and interest on the Gas Committee's outlay. The two Committees were dealing with the same ratepayers' money; and they must work together. The Gas Committee were satisfied that what they were proposing to do would pay.

Not Water-Gas Victims.

When the minutes of the Rochdale Gas Committee were brought up for confirmation at last Thursday's meeting of the Town Council, Mr. Blomley asked the Chairman if there was any truth in the rumour that the deaths of two men who were poisoned in a culvert recently were caused by water gas manufactured by the Corporation. In reply, Mr. Walker said he was glad the question had been put. Carburetted water gas had absolutely nothing to do with the unfortunate accident referred to by Mr. Blomley. On the day in question, and for six clear days before the accident, no carburetted water gas was delivered from the works. He desired to emphasize the point that the public need have no increased alarm on account of the nature of Rochdale gas because of the mixture of carburetted water gas. The products of combustion of carburetted water gas were no more dangerous than the products of combustion of ordinary coal gas. He added that he knew that there was a section of the public who had always been nervous since carburetted water gas was introduced in Rochdale; and whenever there was anything productive of a complaint since then, it had been put down to the water gas. But it was a singular thing that at such times, without exception, they had not been sending out carburetted water gas. It was true that carburetted water gas contained a higher percentage of carbon monoxide; but when the proportion that Rochdale put to ordinary coal gas was added, the carbon monoxide was only slightly greater in the mixed gas than when coal gas alone was being used.

New Joint-Stock Companies.—The Hanwell Pendant Company, Limited, has been registered with a capital of £2000, in £1 shares, to carry on the business of manufacturers of gas-fittings. The Olney Gaslight and Coal Company, Limited, with a capital of £4000, in £10 shares, has also recently been registered.

Water Troubles at Uttoxeter.—The Surveyor (Mr. R. W. Marshall) has reported to the Uttoxeter Urban District Council that on June 19 to 22 the reservoir from which the town is supplied was empty, and the town was practically without water. The residents in the upper parts were the chief sufferers. An investigation showed that some one had gained access to the gauge-chamber, and tampered with the gauges, with the result that the water had passed away as compensation water to farmers and residents in that part of the district, instead of going into the town. He did not know who was responsible for the mischief. The gauge-chamber had been watched; but nothing had been done since. It was resolved to offer a reward of £5 for information as to the offenders.

Prepayment Meter Charges for Gas at Bolton.—At the monthly meeting of the Bolton Town Council last Wednesday, Mr. France moved that the charge for gas supplied through the prepayment meters be fixed at the rate of 1d. per 30 cubic feet, instead of 25 cubic feet as at present, such reduced charge to take effect as from Sept. 30 next. Mr. France complained that he had been unable to get certain particulars from the officials in the Gas Department to support his arguments for the proposed reduction. Alderman John Miles, a Past-Chairman of the Gas Committee, advised Mr. France to let his resolution lie over for the present. The reason he made this suggestion was that probably before the next Council meeting the Gas Committee would have dealt with the matter. Mr. France accepted the suggestion, and the resolution standing in his name is therefore held over until the next Council meeting.

Finsbury Public Lighting.—At the last meeting of the Finsbury Borough Council, the Works Committee reported having had under consideration a letter from the Gaslight and Coke Company with reference to experiments lately carried out by them in certain streets in the borough with inverted burner incandescent gas-lamps. The Company submitted a scheme under which they would, subject to the terms of a contract covering a period of ten years, and providing for payment by the Council of an annual sum of £6913 (including the cost of the necessary installation), provide new all-copper circular lanterns and inverted burners to the whole of the lamps in the borough, and would undertake the painting of the posts, &c., the cleaning, maintenance, and renewal of the lanterns, burners, and mantles, the lighting and extinguishing of the lamps, and the supply of the gas, with all the necessary services. The Committee recommended that the scheme should be accepted. The consideration of the matter was deferred till the next meeting.

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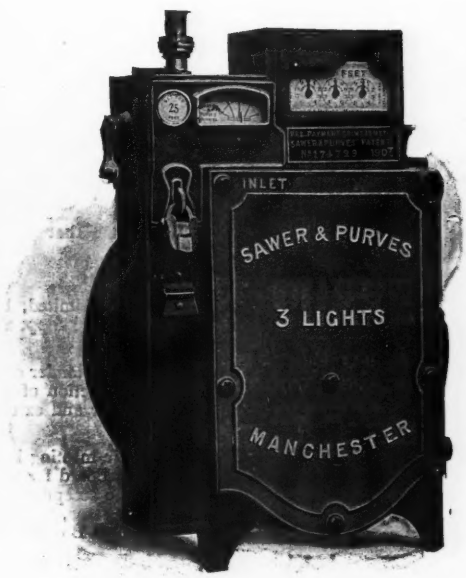

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Increased Meter-Rents at Salford.—At their last meeting, the Gas Committee of the Salford Corporation amended the scale of charges for the use of ordinary meters by increasing the rent for 3-light meters from 6d. to 9d. per quarter.

Carlisle Gas Profits.—The accounts of the Carlisle Gas Committee for the past financial year show a net profit of £5513. The Committee have decided to establish a reserve fund; and for this purpose they have transferred the sum of £500 from the profits.

Failure of the Electric Light at Brighton.—A breakdown at the generating station of the Brighton Corporation caused a failure of the electric light early last Sunday evening; and for a quarter-of-an-hour many of the hotels were in darkness, except for the makeshift illuminating arrangements which could be brought into use.

Fatal Gas Explosion at Meaux.—According to a Dalziel telegram received in Paris last Saturday, a serious explosion occurred on the preceding day at the Meaux Gas-Works of the Compagnie Continentale du Gaz, of Paris. Seven men were very badly injured; and we learn that the Manager (M. Charles Maillot) and a smith have succumbed. It appears that some connections were being made between the valve-house and the gasholder; but the cause of the accident is not known, and probably never will be, as those immediately concerned are no longer alive. It is stated that the extent of the catastrophe would have assumed far greater proportions had it not been for the presence of mind of a man in another department of the works, who shut off the gas from the adjoining holder as soon as the explosion occurred.

Meldreth and Melbourn District Gas and Water Company, Limited.—A circular has been issued by Mr. J. W. Barratt convening a meeting of the creditors of this Company to be held to-day (Tuesday), in pursuance of a resolution passed by them on Feb. 22 last—to the following effect: "That this meeting of the creditors of the Meldreth and Melbourn District Gas and Water Company, Limited, having heard the explanation of the financial position given by Mr. J. W. Barratt, the Receiver appointed by the debenture-holders, hereby agree to defer taking any further proceedings in order to give the Receiver an opportunity of realizing or reconstructing the undertaking, on its being understood that the Receiver will convene a subsequent meeting of the creditors and report to them what steps he has taken." Mr. Barratt regrets that all negotiations for realization or reconstruction have failed; and he is now about to negotiate with the Local Government Board with the view of arranging for the undertaking to be taken over by the local authorities. Failing this, the undertaking will have to be sold by auction. But in either event, from information Mr. Barratt has obtained in the course of the negotiations conducted during the past four months, he is of opinion that the amount realized will be insufficient to pay the debenture-holders in full, and that there will be nothing available for the creditors.

The Leeds Fire-Clay (Canadian) Company, Limited, has been registered with a capital of £10,000, in £10 shares, to adopt an agreement with the Leeds Fire-Clay Company, Limited.

The Rochdale Town Council have accepted the tender of Messrs. Freeman and Son, of Hollinwood, for the construction of a service reservoir at Buersil. The cost of the new reservoir and extensions is put down at £14,000.

The Malvern Urban District Council, at their meeting last Tuesday, decided to apply to the Local Government Board for a loan for the purpose of erecting new purifiers. They also accepted the tender of Messrs. R. & J. Dempster, of Manchester, for same, subject to the sanction being received from the Local Government Board.

Messrs. J. Stone and Co., Limited, Mechanical Engineers, of Deptford, have installed a suite of soft metal melting furnaces, made by the Richmond Gas Stove and Meter Company, Limited. Each furnace carries about 5 cwt. of metal; and the heat is generated by means of a patented gas and hot air principle. The annual gas consumption for the suite will be from 700,000 to 800,000 cubic feet.

While suffering from ill-health, Mr. J. B. Walker, a man well known in the East Riding, attached a rubber tube to a burner and was found dead in his chair with the other end of the tube resting on his chest. The doctor who was called at the inquest expressed the opinion that deceased died from the effects of coal-gas self-administered; and the Jury returned a verdict of "Death from coal-gas poisoning."

It was announced in the "JOURNAL" some weeks ago that Mr. F. E. Pye, son of Mr. T. E. Pye, of Chichester, had been appointed Manager of the Petersfield and Selsey Gas Company, of which his father is the Engineer. At a recent meeting of the Urban District Council, a member referred to the improvement which has taken place in the quality of the gas; and this was testified to by the Council generally.

At a meeting of ratepayers, the Hoyland Urban District Council have been criticized for incurring an expenditure of £400 on negotiations for the purchase of the Elsecar Gas-Works. It was considered that the Council should have consulted the ratepayers as to whether they wished to purchase, before matters had gone so far; and the meeting decided to write to the Local Government Board to ascertain whether the expenditure was legal.

The cookery lectures and demonstrations arranged by Mr. W. Arnott, the Manager of the South African Lighting Association, Limited, to which reference was made in the "JOURNAL" last week (p. 65), were brought to a close on the 17th ult. On the previous evening, there was a competition by five men in the preparation of a breakfast by the aid of a gas-stove. Before it commenced, the lady demonstrator (Miss Mercer) cooked an identical breakfast in 5½ minutes. At the end of 10 minutes all the men had finished, and the prizes were awarded. In the course of her demonstrations, Miss Mercer referred to the interest shown in them. She said a letter received from an up-country lady asked that a stove should be sent to her, and with it a bottle of gas, and an explanation as to how long it would last!

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At the meeting of the London County Council last Tuesday, expenditure not exceeding £650 was sanctioned for the repair and renewal of the gas-mains and the substitution of incandescent for flat-flame burners at the Barking sewage outfall works.

According to the abstract of accounts published by the Doncaster Corporation for the year ending March 31 last, the Water-Works Committee show a deficit of £3928, which is made up from the borough fund. The profit from the gas-works amounted to £6158, of which £5000 has been transferred to the borough fund, and £1158 carried forward to the reserve. There is a surplus on the electricity account of £1222, which has been carried to the renewal fund.

At a meeting of the Teignmouth Urban Council last Tuesday, the Gas Committee recommended that application should be made to the Local Government Board to sanction a loan of £1000 for the provision of slot meters and stoves. Mr. Wheatley stated that in Committee there was a great difference of opinion as to the policy of raising this money. There must come a time when the demand for meters would diminish to some extent; and he would rather wait a little longer and see how things turned out before the Council obtained another loan. He moved, as an amendment, that the matter be deferred for four months, any expenditure incurred in the meantime to be met out of revenue. The amendment was carried by six votes to five.

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OUR DUTY—YOUR PLEASURE.
WHENEVER convenient to you, kindly ask us to furnish Particulars of
HIGH PRESSURE LIGHTING PLANT.
JAMES MILNE AND SON, LIMITED.
EDINBURGH, LONDON, GLASGOW, LEEDS.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers, Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

TAR WANTED.
Telephone: Central Manchester, 7002.
Telegrams: "UPRIGHT."
Apply, THOMAS HORROCKS,
Albert Chemical Works, BRADFORD, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

LUX'S GAS PURIFYING MASS.
See Advertisement on First White Page.
Friedrich Lux, Ludwigshafen-am-Rhein.

BRISTOL RECORDING GAUGES AND THERMOMETERS.
J. W. & C. J. PHILLIPS, 23, College Hill, London, E.C., and 25, Bridge End, Leeds.

R. & G. HISLOP,
GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.
RETORT SETTINGS, COAL-TESTING PLANT, BOILER FIRING.
Communications should be addressed to Underwood House, PAISLEY.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agent, F. J. Nicol, Pilgrim House, Newcastle-on-Tyne.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

IT is Worth Your While to Buy Direct. The RELIANCE LUBRICATING OIL COMPANY supply the best value in NON-CORROSIVE LUBRICANTS—viz., Motor Waggon Oil, 1s.; Motor Car Oil, 2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil, 10½d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.; 650 T Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.; Renown Engine Oil, 11½d.; and Astral Disinfectant, 2s. 6d. per gallon. Barrels free, carriage paid. Solidified Oil, 25s. cwt.
The Reliance Lubricating Oil Company, 19 & 20, Water Lane, Tower Street, London, E.C.

KRAMERS AND AARTS WATER-GAS PLANT.
K. & A. WATER-GAS COMPANY, LTD.
89, VICTORIA STREET, S.W.

AMMONIA. Consumers in any form are invited to correspond with Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Works.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
John Radcliffe, Chemical Engineer, East Barnet.

SPENCER'S PATENT HURDLE GRIDS.
THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, June 21, p. 914.

SULPHURIC ACID.
SPECIALLY prepared for Sulphate of Ammonia Makers by
CHANCE AND HUNT, LIMITED,
Works: Oldbury, Wednesbury, and Stafford.
Address Correspondence and Inquiries to Oldbury, Works.
Telegrams: "Chemicals, Oldbury."

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

GAS TAR wanted,
Brotherton and Co., Ltd., Tar Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, Sunderland, and Wakefield.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

READ HOLLIDAY AND SONS, LTD.,
HUDDERSFIELD,
Are prepared to Supply
BENZOL, TOLUOLE, NAPHTHA, and CREOSOTE in large Quantities.
Enquiries Solicited.

FOR Immediate Disposal.
Manufactured specially for giving Satisfaction.
Any required number of
COKEBREAKERS.
Hand or Power Driven,
Apply, JAMES MILNE AND SON, LIMITED.
EDINBURGH, LONDON, GLASGOW, LEEDS.

ADVERTISEMENT No. 5247—Junior WORKS ASSISTANT.
Applicants are THANKED, and informed that the Position HAS NOW BEEN FILLED.

SITUATION wanted by a Young Man, Son of a Gas Manager, as ASSISTANT-MANAGER or MANAGER of Small Works, or place of Trust. Has been thoroughly Trained for Gas Management.
Address Thos. E. Shadbolt, Gas-Works, Grays.

INSPECTOR (Age 35), Married, thoroughly Practical, Seeks ENGAGEMENT, London or Provinces. Twenty years with late Company.
Address No. 5260, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

STRETFORD GAS COMPANY.
SECRETARY wanted, capable of Taking CHARGE of Office Staff, Cash, and Books. Age from 30 to 40 years. Good References essential.
Apply, by letter, stating Salary required, to the Chairman, Gas-Works, Stretford, Manchester.
July 7, 1910.

WANTED by a Firm of Ironfounders and Chemical Engineers, with Established Trade among Chemical Manufacturers, to undertake the Sole Rights of Making and Selling Chemical Specialities in Great Britain.
Apply No. 5262, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

OWING to Promotion, a Gas Company in Yorkshire require the Services of a Young Man to ASSIST IN THE LABORATORY.
The Candidate must have had Practical Experience in the Photometer, and in making the ordinary Tests of Liquor, Furnace Gases, &c.
Apply, by letter, stating Age, Experience, and Salary required, to No. 5263, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

MANAGER required for a Gas Under- taking in South America. Engagement for a Term of Years. Residence provided. Applicants should state Age, whether Married, Qualifications, previous Experience, Salary required, and whether able to speak Portuguese or Spanish.
Apply, by letter, giving Particulars, with References, and *copies* only of recent Testimonials, to No. 5261, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Retort-House Foreman for the Hendon Works of the Sunderland Gas Company to TAKE CHARGE of an Eight-Hour Shift. Must have had Practical Experience of West's or De Brouwer Stoking Machinery, and a General Knowledge of Gas Manufacture is desirable. Statement of duties will be sent on Application. Wages, with Extras, average about 48s. per week.
Apply, in own hand-writing, to Engineer, Hendon Gas-Works, Sunderland, enclosing *copies* only of recent Testimonials, and stating Age, Experience, present Occupation, whether Married or Single, and when Free.

WANTED, Fifty good, Second-Hand STREET LAMPS.
Price and Particulars to the Manager, Gas-Works, Alford, Lincs.

GASHOLDERS—Splendid 45 feet dia- meter and New STEEL TANK, fixed Complete to Plan and Specification; also 14 feet and 16 feet Diameter GASHOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap, for immediate Sale.
Firth Blakeleys, Thornhill, Dewsbury.

FOR HIRE—One Tank-Waggon suitable for carrying Benzol, and one suitable for carrying Crude Naphtha.
Address The Clayton Aniline Company, Limited, Clayton, Manchester.

FOR Disposal—10-H.P. Portable Steam- ENGINE, practically new, by Marshall and Sons, Gainsborough, insured by National (90 lbs. pressure). 4-H.P. Horizontal STEAM-ENGINE, 5-H.P. Horizontal STEAM-ENGINE BOILER TANK, ⅜ in. Plate, capacity 3070 gallons, absolutely sound. Cheap. Stationary STEAM CRANE, long jib. Offers Solicited.
W. Johnson, Junr., New Hythe, Kent.

PURIFIERS FOR SALE.
THE Malvern Urban District Council are open to receive OFFERS for the following PURIFIERS: Two 16 ft. by 12 ft. by 5 ft.; Four 16 ft. by 8 ft. by 5 ft.; and Two Four-Way Valves and Connections.
Permission to View and further Particulars can be obtained from the undersigned.
The highest or any Tender will not necessarily be accepted.
By order,
W. J. Rendell Baker,
Engineer and Manager.

THE Haworth Urban District Counc l are prepared to receive TENDERS for the Supply of 2500 Tons of GAS COAL (Screened, Unscreened, and Gas Nuts) delivered at the Haworth Station during the ensuing Twelve Months. Sealed Tenders, endorsed "Gas Coal Tender," to be forwarded to me, the undersigned, not later than the 25th inst.
No Special Form of Tender.
William Robertshaw,
Clerk to the Council.
1, Burlington Chambers,
North Street, Keighley.

COUNTY BOROUGH OF OLDHAM.
THE Gas-Works Committee invite TENDERS for the Supply of GAS COALS during a period of Nine Months commencing the 1st of October, 1910.
Conditions and Forms of Tender may be obtained on Application to Mr. A. Andrew, Gas Offices, Oldham, to whom Tenders are to be delivered not later than Tuesday, July 26, 1910.
By order,
J. H. Hallsworth,
Town Clerk.
July 7, 1910.

URBAN DISTRICT COUNCIL OF LYMM.
THE above Council are prepared to receive TENDERS for the Supply of CANNEL and Best Screened GAS COAL, to be delivered at their Gas-Works in Lymm, for a term of Twelve Months from the 1st day of September, 1910.
The probable Quantities required will be about 200 Tons of Cannel and about 2000 Tons of Gas Coal, which must be freshly Wrought, well Screened, and free from Sulphurous Pyrites and other objectionable matter; but the Council reserve the right of increasing or decreasing the Quantities named.
The Person whose Tender is accepted will be required to enter into an Agreement with the Council for the due performance of his Contract.
Sealed Tenders, stating Price per Ton delivered by Boat alongside the Works, to be sent to the undersigned on or before the 20th of July, 1910, and endorsed "Coal Tender."
The Council do not bind themselves to accept the lowest or any Tender.
Forms of Tender are not Supplied.
Further Particulars may be had on Application to the Gas Manager, Mr. W. L. Donaldson.
W. Mullard,
Clerk.
Council Offices, Lymm.
Cheshire, July 1, 1910

TAR AND AMMONIACAL LIQUOR.
THE Lymm Urban District Council are prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works for a term of One Year from the 1st day of September, 1910 (or for such longer term as may be contracted for with the consent of the Council).
Tar and Liquor will be delivered free into Contractor's Boat on the Bridgewater Canal.
Tenders to be sent to the undersigned on or before the 20th day of July, 1910, endorsed "Tar."
The Purchaser will be required to enter into an Agreement with the Council for the due performance of his Contract.
The Council do not bind themselves to accept the highest or any Tender.
Forms of Tender are not Supplied.
Further Particulars may be had on Application to the Gas Manager, Mr. W. L. Donaldson.
W. Mullard,
Clerk.
Council Offices, Lymm,
Cheshire, July 1, 1910.

URBAN DISTRICT COUNCIL OF LYMM.
THE above Council are prepared to receive TENDERS for the Supply of MATERIALS and Execution of WORK required in Connection with New RETORT-BENCH and RETORTS.
Specification, Conditions, and all Particulars may be obtained from Mr. W. L. Donaldson, the Council's Gas Engineer.
The Council do not bind themselves to accept the lowest or any Tender or Tenders.
Forms of Tender are not Supplied.
Sealed Tenders, endorsed "Tender for Extensions," to be delivered to me not later than the 20th of July, 1910.
W. Mullard,
Clerk.
Council Offices, Lymm,
Cheshire, July 1, 1910.

STRATFORD-UPON-AVON CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of 6000 Tons of Good Screened GAS COAL or NUTS for delivery during Twelve Months ending Sept. 30, 1911.

Forms of Tender and other Particulars can be obtained upon Application to the Engineer and Manager.

Tenders to be sent in (and will be accepted only on the Forms supplied) not later than Aug. 6, 1910.

The lowest or any Tender not necessarily accepted.

J. S. CRANMER,
Engineer and Manager.

July 2, 1910.

URBAN DISTRICT COUNCIL OF OLDBURY.

(GAS DEPARTMENT.)

THE Gas Committee of the above Council are open to receive TENDERS for the PURCHASE of Six 15 feet square by 5 feet deep PURIFIERS, with 10-inch Valves, Bye-Passes, Connections, and Travelling Lifting Apparatus, all Complete and in Good Condition, replaced by larger Plant.

Further Particulars may be had on Application to the undersigned.

The Gas Committee do not bind themselves to accept the highest or any Tender.

By order,
A. COOKE,
General Manager.

Gas-Works, Oldbury,
July 4, 1910.

COUNTY BOROUGH OF ROTHERHAM.

THE Gas Committee invite Tenders for the Supply of 22,000 Tons of Screened COAL and 2000 Tons of CANNEL up to June 30, 1911.

Tenders to be sent to the undersigned not later than July 18, next, endorsed "Tenders for Gas Coal or Cannel."

Forms of Tender and Particulars can be obtained from Mr. J. S. Naylor, Gas Engineer.

The Committee do not bind themselves to accept the lowest or any Tender.

W. J. BOARD,
Town Clerk.

Town Hall, Rotherham,
July 1, 1910.

BOROUGH OF ROCHDALE.

TO COLLIERY OWNERS AND OTHERS.

THE Gas and Electricity Committee of the above Corporation invite TENDERS for the Supply of 50,000 Tons of Best GAS COAL (Screened, Unscreened, or Nuts), to be delivered over a period of Twelve Months commencing Sept. 1, 1910.

Forms of Tender and any further Information may be obtained on Application to Mr. T. Banbury Ball, the Manager, at the Gas-Works, Dane Street, Rochdale.

Tenders, endorsed "Gas Coal," and addressed to the Chairman of the Gas and Electricity Committee, must be sent in to me not later than Noon on Wednesday, July 20, 1910.

By order,
WM. HENRY HICKSON,
Town Clerk.

Town Hall, Rochdale,
July 7, 1910.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

THE Commissioners are prepared to receive TENDERS for the Supply of about 700 Tons of OXIDE OF IRON, suitable for Gas Purification purposes, delivered into Waggons, *ex* Ship Granton Harbour, free of all Charges, or in Railway Waggons (North British or Caledonian Railways) Granton Gas-Works.

Any further Information may be obtained upon Application to Mr. W. R. Herring, General Manager, No. 15, Calton Hill, Edinburgh.

Tenders to be lodged at or before Ten a.m. on Monday, the 25th day of July, 1910, sealed and endorsed "Tender for Oxide of Iron," and addressed to the undersigned.

The Commissioners do not bind themselves to accept the lowest or any Offer.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place,
Edinburgh, July 5, 1910.

URBAN DISTRICT COUNCIL OF WINSFORD.

THE above Council are prepared to receive TENDERS for the Supply of CANNEL and Best Screened GAS COAL, to be delivered at the Cheshire Lines Station, Winsford, or the Over and Wharton Station of the London and North Western Railway, or at the Council's Wharf on the River Weaver at Winsford.

The Material is required for a term of Twelve Months ending the 31st of August, 1911.

The probable Quantities required will be about 400 Tons of Cannel and about 2400 Tons of Gas Coal, which must be Freshly Wrought, Well Screened, and free from Sulphurous Pyrites and other objectionable Matter; but the Council reserve the right of reasonably increasing or decreasing the Quantities named.

The person whose Tender is accepted will be required to enter into an Agreement with the Council for the due performance of the Contract.

Sealed Tenders, stating Price per Ton delivered as above, are to be received by the undersigned on or before the 25th of July, 1910, and endorsed "Gas Coal Tender."

The Council do not bind themselves to accept the lowest or any Tender.

Forms of Tender and further Particulars may be had on Application to the Gas Manager, F. Sidwell, Winsford; or from

JNO. H. COOKE,
Clerk to the Council.

Council Offices, Russell Street,
Winsford, Cheshire, July 7, 1910.

COUNTY BOROUGH OF SMETHWICK.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee invite Tenders for the Supply of about 30,000 Tons of GAS COAL and NUTS and 1000 Tons of CANNEL.

Form of Tender and further Information may be obtained of the undersigned.

Sealed Tenders, endorsed and addressed to the Chairman of the Gas Committee, Council House, Smethwick, to be sent in not later than the 22nd inst.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
W. J. STURGES,
Secretary.

Gas Offices, Council House,
Smethwick.

MARKET HARBOROUGH URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for the Supply of the whole or part of 4500 Tons of Best Screened GAS COAL and NUTS, to be delivered during the Year ending June 30, 1911, at the London and North Western or Midland Railways Station, Market Harborough.

Conditions and Form of Tender may be obtained from the undersigned, to whom Sealed Tenders, endorsed "Tenders for Gas Coal," must be delivered not later than Saturday, the 23rd inst.

The lowest or any Tender not necessarily accepted.

ALFRED T. HARRIS,
Manager and Secretary.

Gas Offices, St. Mary's Road,
Market Harborough, July 8, 1910.

URBAN DISTRICT COUNCIL OF LEIGH-ON-SEA.

(GAS DEPARTMENT.)

THE above Council invite Tenders for the Supply and Delivery of a NEW STATION GOVERNOR of approved Modern Type for the Regulation of Gas Supply to the District.

The Governor is to be capable of passing 50,000 Cubic Feet per Hour under a 2½-inch pressure, and is to be complete with suitable connections for working in conjunction with 12-inch Mains.

ALTERNATIVE TENDERS

are invited for the Supply and Delivery of a Second-Hand STATION GOVERNOR of similar capacity with the like Connections.

The Governor must be in thorough working order; and a guarantee will be required.

Sealed Tenders, marked "Tender for Governor," must be sent so as reach me, the undersigned, not later than Twelve o'clock on Wednesday, the 20th day of July, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

Dated this 8th day of July, 1910.

W. CARLYLE CROASDELL,
Clerk to the Council.

Council Offices, Leigh-on-Sea.

GAS-WORKS, FREEHOLD LAND, AND COTTAGES AT TARPORLEY, CHESHIRE.

FOR SALE BY TENDER

THE Tarporley Gaslight and Coke Company, Limited, all that Freehold plot of Land situate at Tarporley, in the County of Chester, together with the Gas-Works erected thereon and known as

THE TARPORLEY GAS-WORKS,

and also as a Going Concern, the Business carried on by the said Company as from the 30th day of September, 1910, with the DISTRIBUTING PLANT including MAINS, SERVICES, METERS, COOKERS, and such of the CONSUMERS' FITTINGS as are the property of the Company; and also the benefit of all Pending Contracts and Engagements entered into by the Company.

And also all those FOUR FREEHOLD COTTAGES adjoining situate and Numbered 3, 5, 9, and 11, Eaton Road, Tarporley, aforesaid. Gross rentals £34 9s. per Annum.

Tenders to be sent, under cover and sealed, to the Vendors' Solicitors, on or before the 2nd day of August, 1910.

The Vendors do not bind themselves to accept the highest or any Tender.

Forms of Tender and of the Conditions upon which such Tender is received and further Particulars may be obtained at the Offices of the said Company, Eaton Road, Tarporley, or Messrs. THOS. SMITHURST and Co., Chartered Accountants, 26, Pall Mall, MANCHESTER, or Messrs. RICHARD HIGHAM and Co., Vendors' Solicitors, 49, Princess Street, MANCHESTER.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

PATENT.

THE Proprietor of the British Patent No. 10,616/05 for "IMPROVEMENTS IN MEANS FOR GENERATING AND USING HYDRO-CARBON VAPOURS FOR HEATING AND LIGHTING PURPOSES" desires to sell his Patent or to Grant Licences thereof.

All Communications should be addressed, in the first instance, to L. DUVINAGE, Patent Agent, 10, Avenue des Nerviens, BRUSSELS.

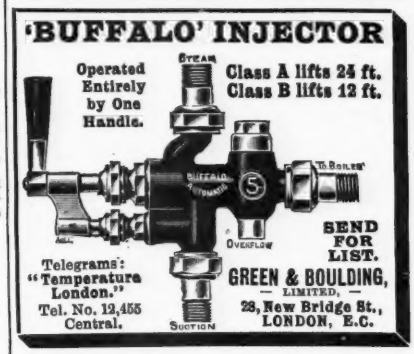
NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

'BUFFALO' INJECTOR



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Telegrams: "Temperature London." Tel. No. 12,455 Central.

GREEN & BOULDING, — LIMITED, —
28, New Bridge St., LONDON, E.C.

MIRFIELD GAS COAL.

UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

JOHN HALL & CO. OF STOURBRIDGE,
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STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

HEATHCOTE GAS COAL
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GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

MIDLAND ENAMELLING CO.,
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DIALS (Enamelled)
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DIALS
For Pressure Scales in One Length up to 4 feet.
DIALS
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140, Finch Rd., Handsworth, Birmingham.
Telephone: "Northern 250." Telegraphic Address: "ENAMELLING BIRMINGHAM."

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BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
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Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large Stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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STEEL OF ALL DESCRIPTIONS.
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Special Pressure and Pressure & Exhaust Registers.
For RETORT-HOUSE GOVERNORS.
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Fullest particulars on application to—
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Of our Manufacture
STOP WASTE AND LEAKAGE
They are guaranteed not to contract and do not readily split and fracture but retain apparent wholeness after a long period of work.
Top Quality FIRE-BRICKS, QUARRIES, &c.
High Grade Silica Bricks and Blocks for Combustion Chambers and Special Work.
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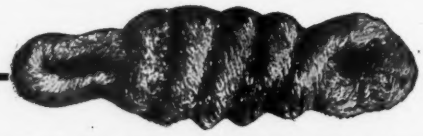

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Every Skein of equal weight and length.
The Lead Wool Joint is built up evenly all the way through.
Lead Wool requires no melting and can be used in water without risk.
Lead Wool Joints are Twice as Strong as Cast Lead Joints and cost 33⅓ per cent. less.
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Telegrams: "STRENGTH, SNODLAND." Telephone 199 SNODLAND.

Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.
Construction of
Entire Gas-Works & Coke Oven Plants,
Retort Furnaces,
Furnaces for Chamber Settings (*Patent*), **New Coke Ovens** (*Patent*),
With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.

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Important Improvements.

BURNERS.

1. **20-Candle Power more light** without increase in the consumption of gas.
2. **Patent Gas Adjuster;** cannot get out of order.
3. **Automatic Gas Regulator,** ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. **Accurate Regulation of the Air Supply.**
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

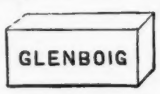
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

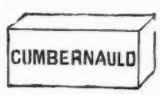
THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE MARKS.

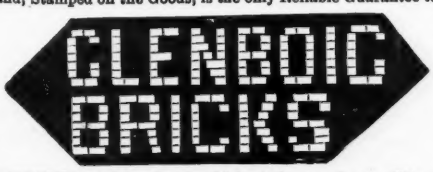




The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.
The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.



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Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas of Honour.
Highest Award wherever exhibited.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET,
LONDON, E.C., September 21st, 1909.

DEAR SIRS,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3·03	3·49
Silica, combined	43·20	49·77
Alumina	36·55	42·10
Ferric oxide	1·80	2·08
Titanic oxide	1·30	1·50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0·92	1·06
Loss on Ignition	13·20	—
	100·00	100·00

PHYSICAL RESULTS.

Density	2·65
Volume weight	1·90
Porosity	15·4 %
Linear shrinkage at 100° C.	3·70%
" " " 1050° C.	4·76%
" " Total	8·46%
Volume shrinkage at 100° C.	10·7 %
" " " 1050° C.	12·6 %
" " Total	23·3 %
Plasticity	20·0 %
Fire Stability	1850° C. equiv. 3362° F. (SEGER CONE 36.) (New Scale CONE 38.)

(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes.—I am, yours faithfully,

JOHN T. NORMAN.

METROPOLITAN GAS METERS, LIMITED,

SOLE MAKERS AND LICENSEES OF THE

"Simplex" AUTOMATIC GAS LIGHTER AND EXTINGUISHER.

Some of its Special Advantages are:

1. It is instantaneous in Lighting and Extinguishing without shock to Mantle, and can be set to its pre-determined times in a few seconds.
2. The Mechanism will act correctly, even though the Lamp-post and Controller be out of the perpendicular.
3. **THE VALVE.**—As this never leaves its seat, and the gas-ways being away from the seating, no impurities can collect between the valve and the seating, and by simply removing a small cap, the gasways can be freed of Naphthalene or any other matter.
4. The leakage of gas into the Clock Mechanism and its resultant troubles are entirely done away with.
5. Vibration of any description will not cause the Mechanism to operate prematurely.
6. The "Simplex" Clock also has the advantage of a Lever E capement.

PRICES AND PARTICULARS ON APPLICATION.

OFFICES AND WORKS AT
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Workmanship and Materials of the Highest Quality.

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Built to any Specification or Gauge.

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ATLAS LOCOMOTIVE WORKS, BRISTOL.

THE WIGAN COAL & IRON CO., LIMTD.,

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone: No. 200.

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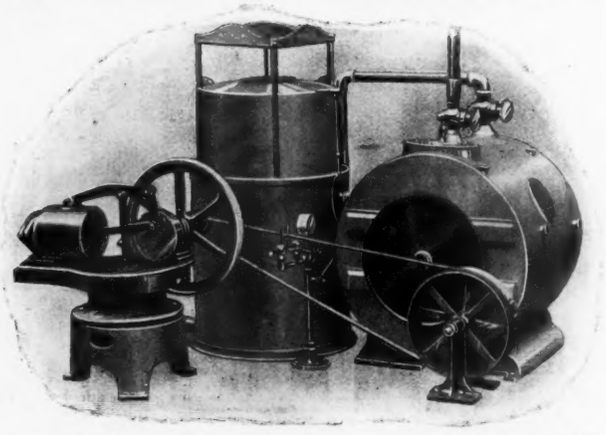
FOR

Lighting, Cooking, Heating

FOR

Villages,
Mansions,
Farm Steadings,
Churches, Schools,
Railway Stations,
County Lighting Districts.

Plants from 100 cub. ft. per hour up to 50,000 cub. ft. per hour for Gas Works.



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WILLIAM KEY, Engineer.

109, HOPE STREET, GLASGOW. 11, QUEEN VICTORIA STREET, LONDON.

NON-EXPLOSIVE and ECONOMICAL.

Welsbach LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

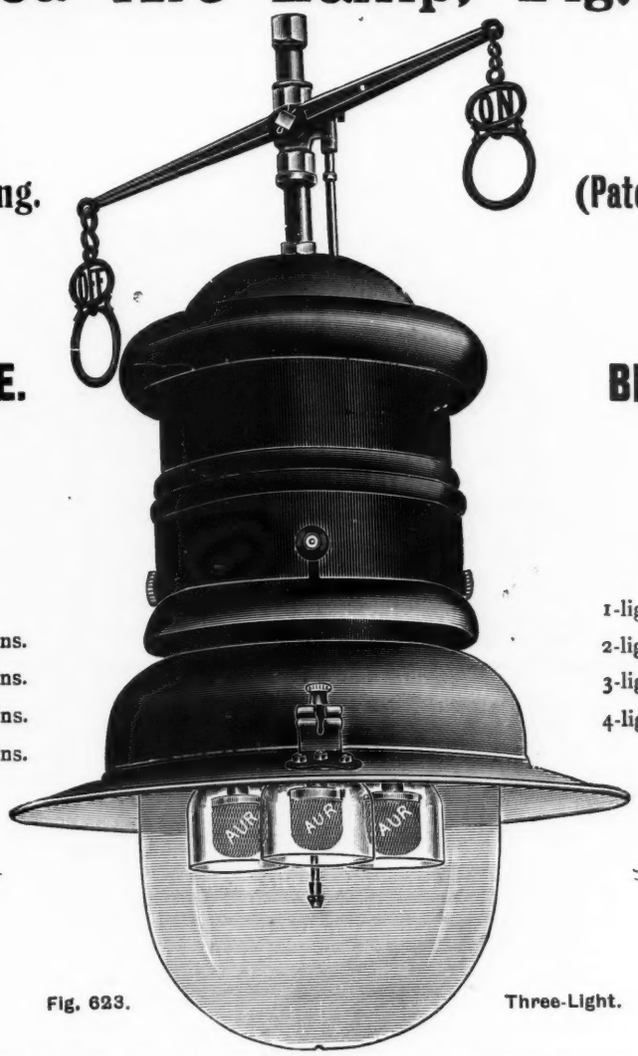

Fig. 623. Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*		*Gas per hour.*	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.	3-light	12 feet	400	**52/6**	**6/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.	4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*		*1-Light.*	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**	Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**	Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made
Case contains . .	*80*	*18*	*18*	*12*	Welsbach Mantles, each **6d.** subject as usual.				

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
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Telegrams and Cables: "WELSBACH LONDON." *Telephone* 2410 NORTH.

EDGAR'S "BLENHEIM" GAS FIRE

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and
what is more valuable
GOLDEN OPINIONS EVERYWHERE.

Do you want

GAS LAMPS, FIRES, RADIATORS, GEYSERS, FITTINGS, GREENHOUSE HEATERS, FLASHING SIGNS, &c., &c.?

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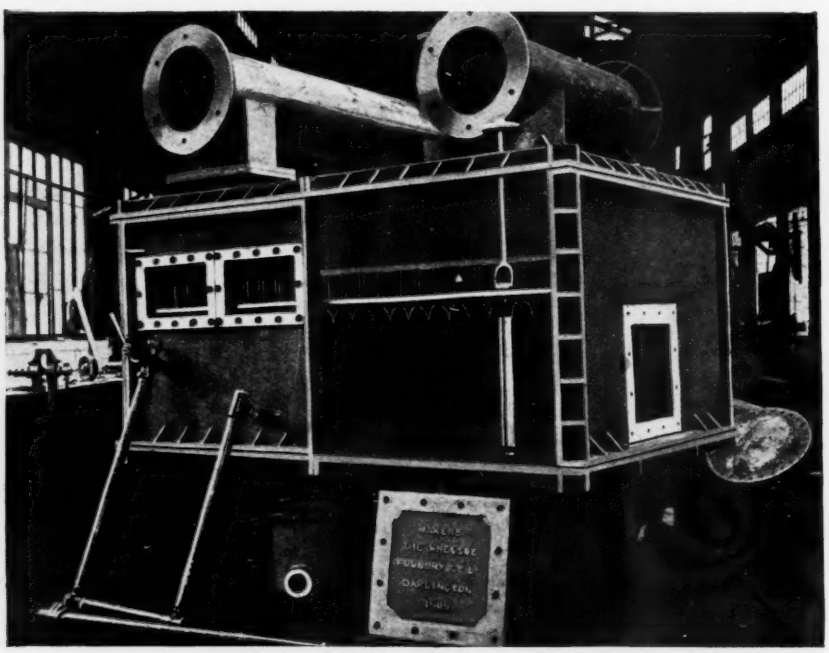
Gasholders.

Condensers.

Purifiers.



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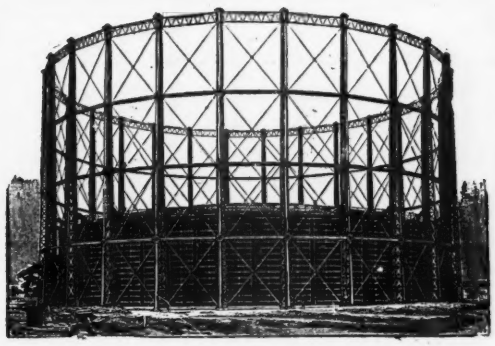

Triple Lift Gasholder, 212 ft. 6 in. diameter by 45 feet. Lifts, erected at Garston, Liverpool.

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STEEL PIPES.
STEEL TANKS.
CONSTRUCTIONAL STEEL WORK.

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Aggregate capacity of Plant supplied 233,000,000 cubic feet daily.

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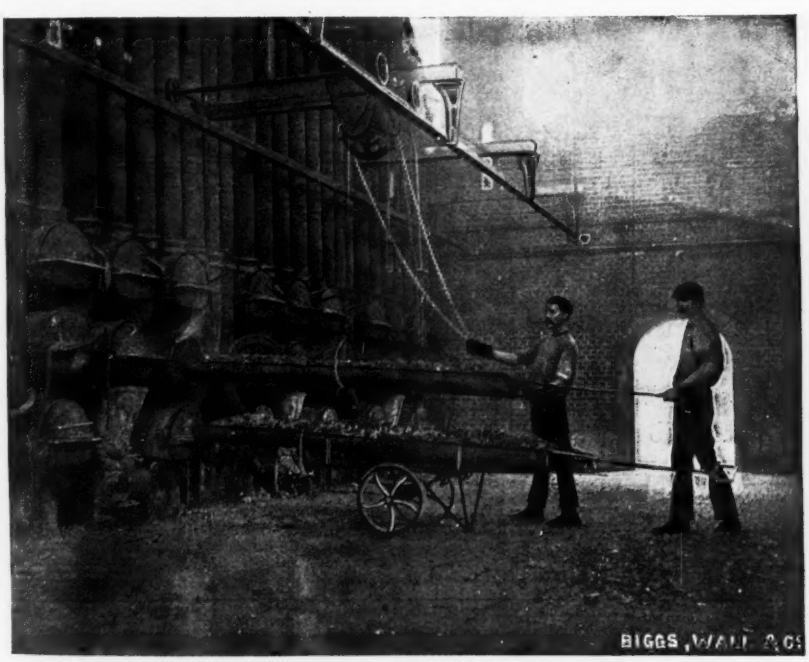
SIMPLE AND INEXPENSIVE.



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INCREASED YIELD OF GAS and REDUCTION OF FUEL CONSUMPTION.

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Also for name of Works where you can see Machines in operation.

ADDITIONAL REVENUE FOR GAS-WORKS.

COKE SELLING . . AT 11/6 A TON
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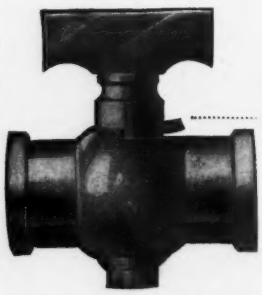

FIG. 1. The Old Style with the Old Trouble.
Note the Pin **A.**

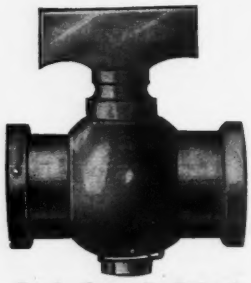

FIG. 2. **Evered's Patent "Safety Stop."** No Pin. No trouble.

FIG. 3. Underside showing "Safety Stop" in lieu of Pin.

EVERED'S PATENT
"SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

EVERED'S PATENT
"SAFETY STOP"

renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

The projection shown in Fig. 3, marked **B,** working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

Any fitting specifically so ordered will be made with the "Safety Stop."

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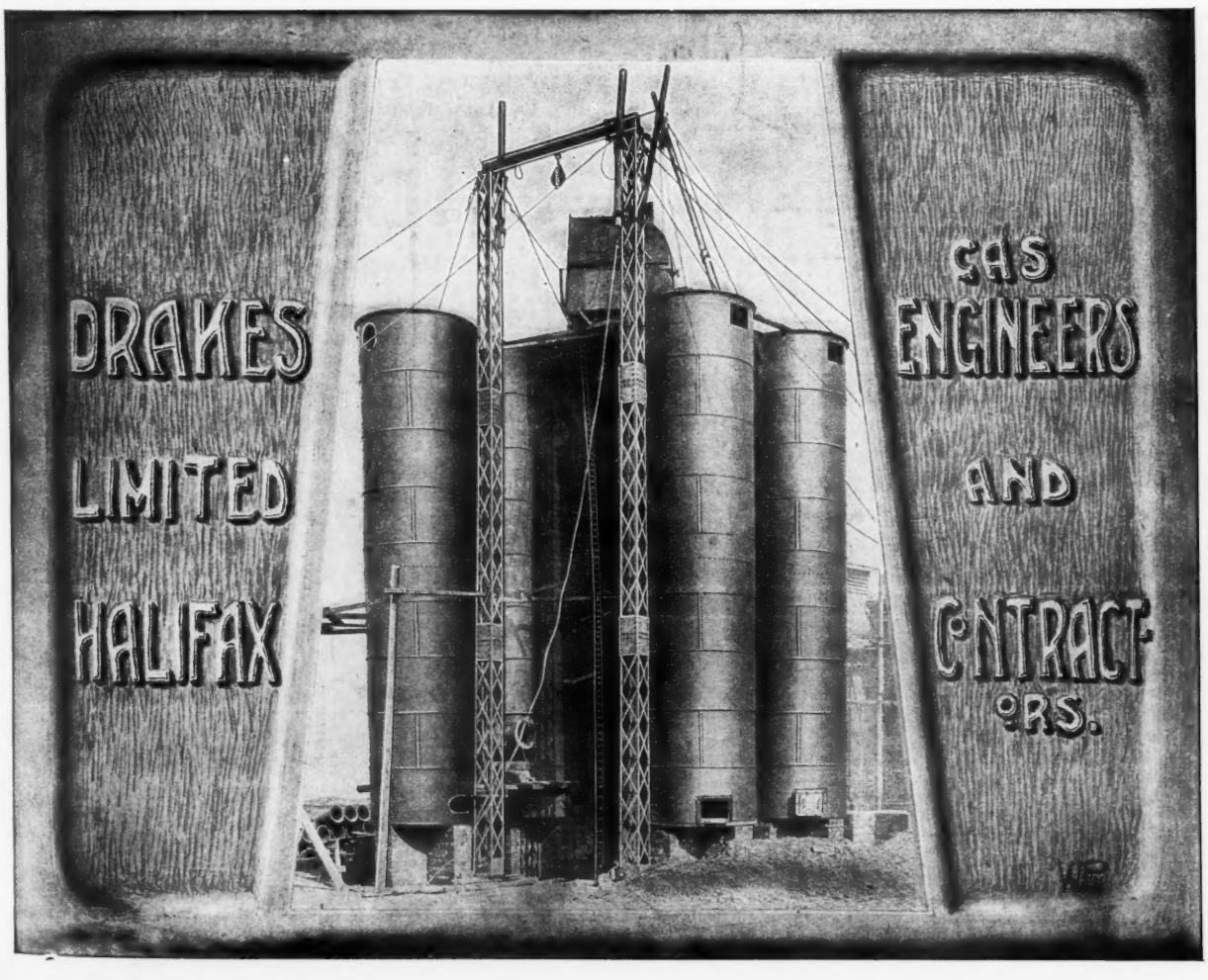
RETORTS



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